United States
Department of
Agriculture

Soil
Conservation
Service

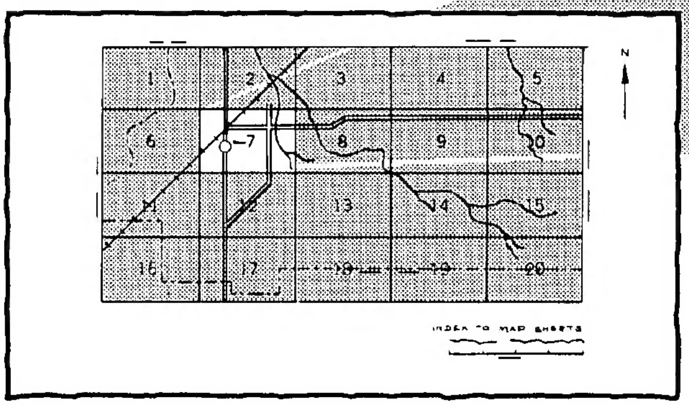
In Cooperation with
University of California
Agricultural Experiment Station

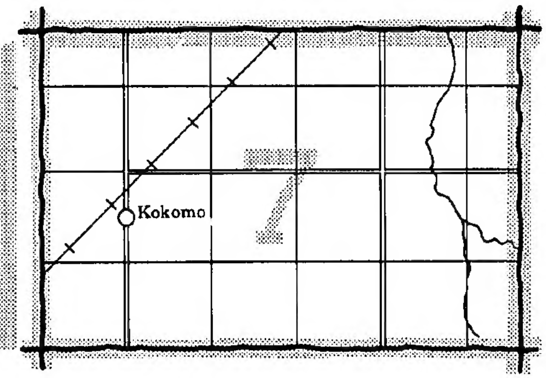
Soil Survey of San Bernardino County California

Mojave River Area

HOW TO USE

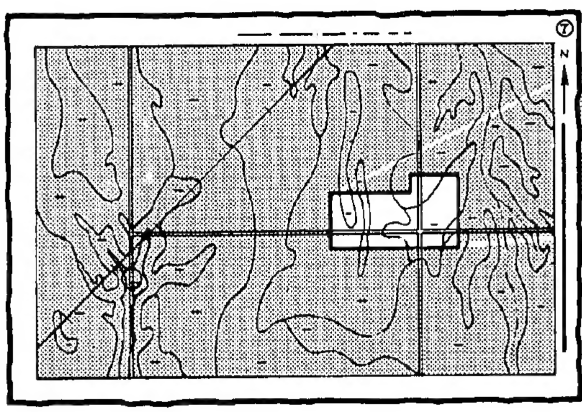
1. Locate your area of interest on the "Index to Map Sheets."

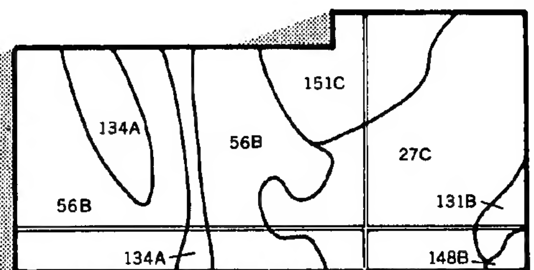




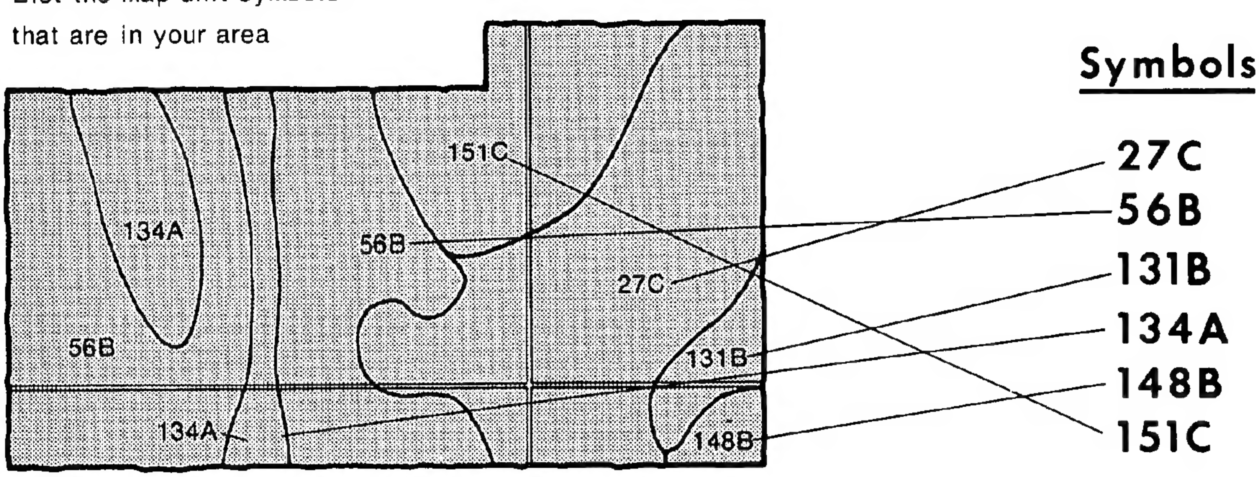
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



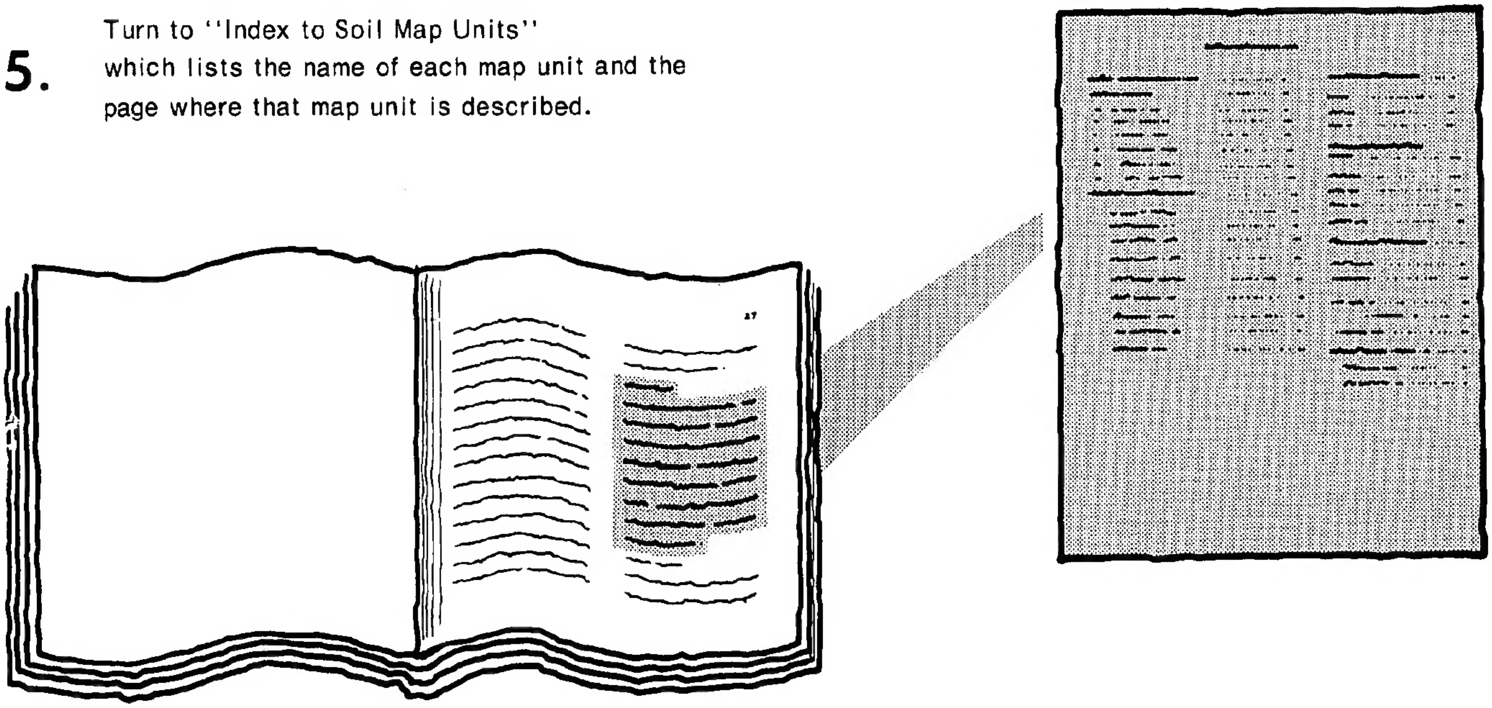


4. List the map unit symbols that are in your area

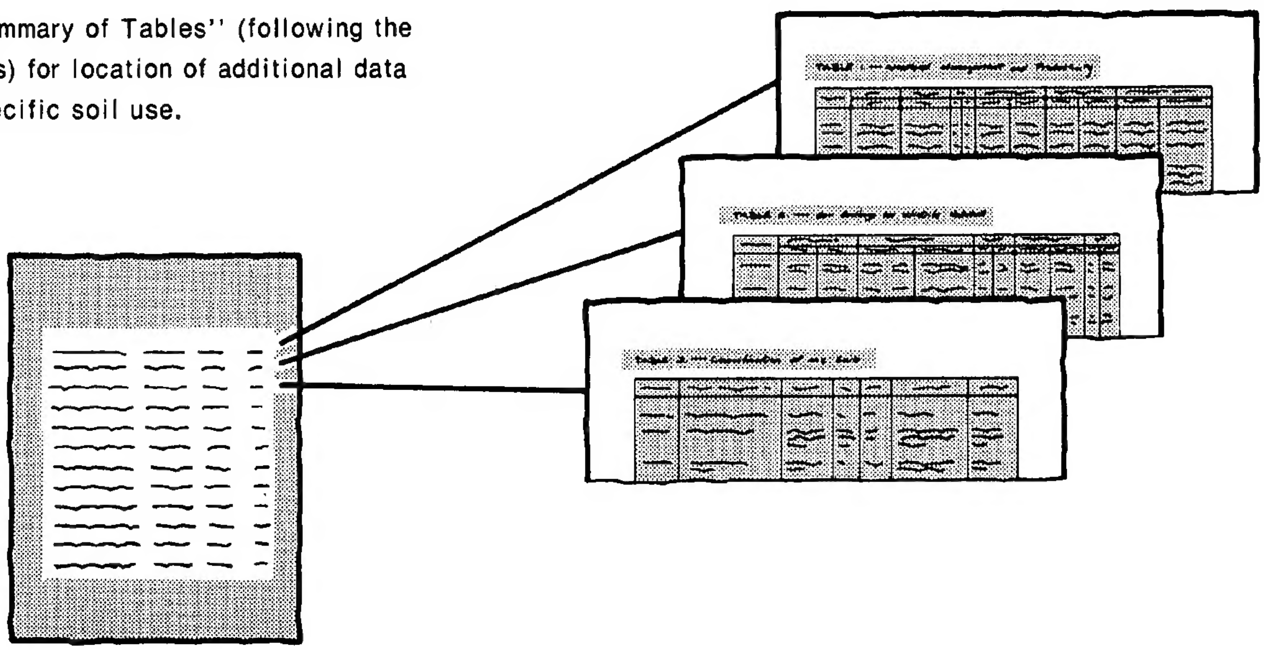


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1978. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978. This survey was made cooperatively by the Soil Conservation Service and the University of California Agricultural Experiment Station. It is part of the technical assistance furnished to the Mojave Desert Resource Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Creosotebush, Joshua-tree, grasses, and herbs are natural vegetation on Cajon sand, 2 to 9 percent slopes. Rock outcrop-Lithic Torriorthents complex, 15 to 50 percent slopes, on upland at right. Apple Valley in background.

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Soil Series

Issued February 1986

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Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in San Bernardino County, Mojave River Area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Eugene E. Andreuccetti
State Conservationist
Soil Conservation Service

Location of San Bernardino County, California, Mojave River Area.

Soil Survey of
San Bernardino County, California
Mojave River Area

By Arlene J. Tugel and George A. Woodruff, Soil Conservation Service

Fieldwork by George A. Woodruff, John W. Florin, and
Arthur F. Fischer III, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
In cooperation with
University of California Agricultural Experiment Station

The MOJAVE RIVER AREA is in the southwestern part of the Mojave Desert, in San Bernardino County, California. The survey area is 1,200,000 acres, or about 1,875 square miles. It is about 45 miles wide from east to west and about 40 miles long from north to south. The survey area is bordered on the south by the San Bernardino National Forest and the Angeles National Forest. It borders Los Angeles County along part of the western boundary. Much of the land north, east, and west of the survey area is publicly owned and is administered by the Department of the Interior, Bureau of Land Management.

The Mojave River originates near the southern boundary of the survey area. It flows northward through about half of the survey area and then flows eastward. The lowest elevation in the survey area, about 1,700 feet, is in the area where the Mojave River crosses the eastern boundary. The highest point, about 6,200 feet, is in the San Bernardino Mountains.

Annual precipitation ranges from 4 inches in the Mojave Valley to 25 inches in the San Bernardino Mountains. The natural vegetation is mainly desert shrubs and grasses. Some pinyon and juniper is at the southern edge of the survey area.

About 3 percent of the survey area is used for irrigated crops. Alfalfa, small grain for hay, and irrigated pasture are the main crops. Most of the survey area is desert land used as wildlife habitat and for grazing and recreation. The Bureau of Land Management administers about 25 percent of the land in the Mojave River Area. Homesite development, which is increasing in scattered locations across the entire survey area, is most extensive in the Hesperia, Victorville, and Barstow areas. The population in the survey area in 1979 was about 99,000.

Seven older surveys of parts of the Mojave River Area were published during the period 1921 to 1970 (*10, 12, 13, 14, 17, 26, 30*). The present survey updates the earlier surveys and provides additional information and larger maps that show the soils in greater detail.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent survey areas. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, or the extent of soils within the survey area.

General Nature of the Survey Area

This section provides information about the Mojave River Area of San Bernardino County. It discusses history and development; physiography, relief, and drainage; natural resources; water; and climate.

History and Development

By Harlan D. McIntire, district conservationist, Soil Conservation Service.

The petroglyphs and artifacts found throughout the area establish man's existence in the Mojave River Area long before our present civilization. The "Early Man

Archeological Site," near Yermo, contains some of the earliest evidence of man's presence in North America (*18*).

The first Europeans arrived in 1772, when Pedro Fages, commander of the Spanish forces in California, entered the area (*7*). At this time the Serrano, a branch of the Shoshone Indians, were living in areas along the river and the Chemehuevi, a branch of the Paiute Indians, were living in desert areas away from the river.

In the 1860's, a drought in parts of California caused cattlemen to move to the Mojave River Valley looking for feed for their cattle. To protect travelers and the ranchers from Indian attack, the U.S. Army established Camp Cady on the Mojave River, about 15 miles downstream from Daggett. This site was chosen because of the abundant water supply.

Gold, silver, and borax mines in the Mojave Desert and gold mining in the San Bernardino Mountains stimulated travel and settlement in the area from the middle to the end of the 19th century.

In 1882 the Southern Pacific Railroad started a line from the town of Mojave east to the Colorado River. Daggett became an important transportation and supply center for the mines. In 1885, the Santa Fe Railroad built a rail line north from San Diego through Cajon Pass and along the Mojave River. It joined the Atlantic and Pacific Railroad at a point 9 miles west of Daggett. The completion of this line stimulated activity in the Mojave Valley and influenced the establishment of Barstow, Victorville, and other settlements along the line.

In 1905 the San Pedro, Los Angeles, and Salt Lake Railroad was constructed. It ran from Riverside to Daggett and then to Salt Lake City. This line later was purchased by the Union Pacific Railroad, and Yermo became a division point.

Water from the Mojave River was used in agriculture first by the ranchers along the river. Around 1870 a few irrigation ditches were constructed to divert water from the river.

Ambitious plans were made for water development in the vicinity of Victorville, Barstow, Daggett, and Yermo. The Daggett ditch was partially constructed in 1884 but was not completed until 1902. The land at Daggett was the first large area of desert to be irrigated. Despite early confidence, the effort failed. It was not until the early part of the 20th century that water for irrigation was pumped from wells along the river and in the valleys.

A 1917 compilation of data on the Mojave River and Victor Valley areas showed that 3,095 acres was irrigated by water diverted from the river and 6,755 acres was irrigated by water from wells. In 1934 the only available statistics show that total irrigated acreage was down to approximately 6,550 acres. At the time it was estimated that only 200 to 300 acres was irrigated by water diverted from the river.

Around 1920 it was believed that growing deciduous fruit had great promise in the Mojave Valley. A California State Bulletin for the period showed that 796 acres was used for apple and pear trees. Several vineyards were established in the Adelanto area during the same period. According to the San Bernardino County Agricultural Commissioner's report for 1929, fruit represented nearly 13 percent of the total crop value in the Mojave Desert part of the county. Most orchards were abandoned during the Great Depression, and by 1934 fruit represented little more than 1 percent of the total crop value. In 1934 it was estimated that 90 percent of the irrigated land was in alfalfa and the rest was in orchards, vegetables, and field crops.

In the 1940's the population in the area grew as a result of increased military activity. In 1930 the population was approximately 6,200, and by 1950 the population had increased to 22,700 (*6*).

The acreage of irrigated land increased sharply after World War II, to an estimated 18,000 acres in 1951. After this period of accelerated growth, agricultural activity remained stable into the 1970's. Sprinkler irrigation systems were installed on much of the newly developed land, and they were used to replace some flood irrigation systems. Larger and more efficient farm equipment was used, but alfalfa hay and poultry products continued to be the major agricultural products.

The increased use of the land for farming, homesite development, and recreation has caused a reduction in cattle ranching in the area; however, some areas along the Mojave River in Summit Valley and at Camp Cady are still used for grazing cattle. The desert range, once used for grazing cattle, is now mainly used for grazing sheep. The sheep are brought into the area for a few weeks each spring when moisture is adequate and plant growth is at its peak.

Although the acreage of irrigated land remained stable after the early 1950's, other phases of the economy continued to grow. The population of the area is estimated to have been approximately 53,000 in 1960 (*6*), 81,500 in 1975, and 99,000 in 1979 (*28*). Some desert land, especially in the areas of Hesperia, Victorville, and Barstow, is now used as homesites.

Physiography, Relief, and Drainage

The Mojave River Area includes two physiographic regions. The San Bernardino and San Gabriel Mountains, which are along the southern edge of the survey area, make up 5 percent of the area, and the Mojave Desert makes up the remaining 95 percent of the area.

Even though only a small acreage of the San Bernardino and San Gabriel Mountains is within the survey area, major watersheds in these mountains contribute to the streamflow in the Mojave Desert. Sheep Creek originates in the San Gabriel Mountains, and the West Fork of the Mojave River and Deep Creek originate in the San Bernardino Mountains and are the headwaters of the Mojave River.

Within the survey area, the soils on mountainsides are moderately steep to steep. The soils along Sheep Creek and in Summit Valley are gently sloping to moderately sloping.

There are many types of landforms in the Mojave Desert. Characteristic landforms include broad alluvial fans, old dissected terraces, and playas. The desert also includes the Mojave River and its flood plain and scattered mountains that dominate the landscape.

The Cajon Fan is at the southern edge of the Mojave Desert, in the southwestern part of the survey area. It is a broad surface of coalescing alluvial fans and terraces. Part of the Cajon Fan is called Baldy Mesa. The Cajon Fan formed in sediment eroded from the San Gabriel and San Bernardino Mountains. It is a composite of soils from the Pleistocene and Recent times. The fan extends from the base of the mountains for 10 to 15 miles to the Mojave River east of Hesperia, to Adelanto, and to Mirage Lake. The center part of the upper edge of the Cajon Fan no longer joins the mountains. Tectonic activity in the surrounding area and subsequent erosion have truncated the upper edge to form the Inface Bluffs. About 1 mile of these south-facing bluffs is within the survey area. Broad washes of the desert, such as the Oro Grande Wash, at one time drained large watersheds and are also truncated at the Inface Bluffs.

The Mojave River flows along the eastern edge of the Cajon Fan. The river originates where the West Fork of the Mojave River joins Deep Creek, and it flows northward and then eastward past Barstow. The flood plain of the Mojave River is 0.5 to 1 mile wide along most of the river. The soils on the flood plain are nearly level. In some places, such as at Upper Narrows where the river cuts through hard rock, there is no flood plain. East of Barstow, the flood plain and river terraces form the broad Mojave Valley.

The Mojave is sometimes called the "upside-down river" because through most of its course water generally flows underground; water flows above ground only after storms, yet miles downstream it surfaces and flows for a distance. The perennial aboveground flows are caused by natural underground barriers, which force ground water to the surface.

The Mojave River has only 3 major tributaries within the desert—the Fremont Wash, Buckthorn Canyon, and Oro Grande Wash. These tributaries flow only after intense storms.

Drainageways on the broad fans of the Mojave Desert are commonly made up of divergent channels. Typically, a channel from the adjacent mountain enters the alluvial fan at its upper edge. It splits many times, and some of the channels disappear. Near the valley floor, the channels begin to converge again. Sheep Creek is an example of a stream that has this type of drainage pattern.

There are numerous closed basins in the survey area. These basins, or intermontane valleys, are made up of coalescing alluvial fans, a playa, and the surrounding mountains. Fifteen Mile Valley, which includes Rabbit Lake, and Lucerne Valley, which includes Lucerne Dry Lake, are both closed basins. Other playas in the survey area are El Mirage Lake, Harper Lake, and Troy Lake. Unlike the nearly level to strongly sloping soils on alluvial fans, the nearly level soils adjacent to playas have restricted drainage.

Some of the oldest soils in the survey area are those on dissected terraces south of Barstow, Daggett, and Helendale, near Hodge, and on Baldy Mesa. The soils on these terraces formed during the Pleistocene.

There are numerous mountains scattered across the Mojave Desert region of the survey area. Some of the well known landmarks are Bell Mountain, north of Apple Valley, and Stoddard Mountain. The tallest peak in the desert, Goat Mountain, has an elevation of 4,950 feet and is north of Upper Lucerne Valley. The mountains, which are predominantly Rock outcrop and support vegetation only in the cracks between the rocks, are called inselbergs. About 7 percent of the land area in the desert is Rock outcrop. Another 7 percent is made up of shallow soils on mountainsides.

There are many fault zones in the survey area. Most of them are aligned in a northwest-southeast direction. The Calico Fault is just north of Newberry, in the Mojave Valley. On the southwestern side of the fault, there is a fairly high water table that has influenced the formation of strongly saline-alkali soils. The soils on the northeastern side of the fault are not affected by the water table and are only slightly saline-alkali. The fault itself is marked by a line of sand dunes.

Natural Resources

In addition to soils, the Mojave River Area has numerous other natural resources. The diversity of topography and geologic features is a scenic resource, and the various mineral deposits, plants, and wildlife communities are also natural resources (*29*).

Minerals and construction material are in scattered locations throughout the survey area. The major minerals that are extracted are gold, silver, feldspar, uranium, copper, iron, tungsten, turquoise, zeolite, barite, and clay. Material removed for use in construction includes limestone, sand, and gravel for cement and aggregate for such uses as road construction.

Water

By Harlan D. McIntire, district conservationist, Soil Conservation Service.

The availability of suitable ground water has determined the pattern of land use throughout the survey area because wells furnish nearly all water for agriculture, industry, and domestic use. Wells are used to remove the ground water from alluvial deposits.

The water-bearing alluvial deposits of the Mojave River are the major source of ground water in the survey area. Hard rock formations along the river divide the coarse river deposits into numerous subsurface basins. Water from the river is trapped in these basins and is the source of ground water (fig. 1).

The aboveground flow of the Mojave River is intermittent in most places. Along most of its course, water flows above ground only after storms. Perennial flows occur near Victorville, in the vicinity of Camp Cady, and in Afton Canyon. In these places hard rock barriers force ground water to the surface.

Other basins in the area from which considerable ground water is removed are in the area of Lucerne Valley, El Mirage, and Harper Lake.

Tremendous quantities of water exist within the alluvial sediment underlying much of the area. It was estimated that in 1961 more than 30 million acre-feet was in ground water storage in the area. Since the late 1940's, the level of the water table has declined, indicating that the rate of water use has exceeded the rate of natural recharge. It is estimated that during the 25-year period from 1936 to 1961, the rate of water loss from storage was 20,000 acre-feet per year (*6*). It is estimated that in 1979 the rate of loss had increased to approximately 30,000 acre-feet per year (*9*).

Nearly all recharge of ground water in the basins within the survey area is provided by precipitation that falls in the San Bernardino and San Gabriel Mountains. Some areas in the San Bernardino Mountains within the watershed of the Mojave River have an average annual precipitation rate of more than 40 inches. In years of high runoff, some ground water is recharged in many locations, especially those close to the river. Basins near the headwaters of the Mojave River and those adjacent to the mountains receive recharge every year. Downstream basins receive little recharge in normal years. These basins provide a natural regulation of the water supply. In wet periods, water can be stored for use during dry periods.

The amount of water in the Mojave River varies greatly from year to year. As measured at the Forks, it was more than 300,000 acre-feet one year (*3*) and less than 10,000 acre-feet another (*15*). The average annual runoff into the Mojave River as computed for the base period 1936 to 1961 was 62,000 acre-feet per year. Different average runoff rates have been computed for other base periods.

The Mojave Water Agency was formed by an act of the State legislature in 1960 to find ways to supplement the natural water supply. The survey area is within the region administered by the Mojave Water Agency. The agency has contracts with the State of California that entitle the agency to purchase as much as 50,800 acre-feet of water per year from the California Water Project. The water is to be taken from the California Aqueduct, part of which goes through the survey area. Three turnouts for water delivery were constructed, and various plans have been proposed for the distribution of the water within the area, but none of the plans has been adopted. Purchased water for domestic and industrial use would be an important supplement to the natural water supply in the area.

Although there are vast quantities of water within the ground water basins, some of the water is of poor quality. The mineral quality of the ground water within the survey area varies greatly. The geologic setting of the basins directly affects the degree of ground water mineralization. In general, basins near the source of recharge are less mineralized than those that are more distant. Water near playas generally is of poor quality. Water taken from the basins in the areas of Harper Lake, the northern part of El Mirage, and the northern part of Lucerne Valley is highly mineralized.

Because of the arid nature of the survey area, the water supply is the single most important resource. The presence or absence of a reliable supply of good quality water has determined the pattern of agricultural, urban, and industrial development and will continue to do so.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

In the survey area, summers are long and very hot. Winters are quite warm despite an occasional series of days when the nightly minimum temperature drops below freezing. Rainfall is scant in all months, and irrigation is required for all crops.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Barstow and Victorville, California, in the period 1951 to 1977. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 47 degrees F at Barstow and 45 degrees at Victorville. The average daily minimum temperature is 33 degrees at Barstow and 30 degrees at Victorville. The lowest temperature on record, which occurred at Barstow on January 13, 1963, is 3 degrees. In summer, the average temperature is 82 degrees at Barstow and 77 degrees at Victorville. The average daily maximum temperature is 97 degrees. The highest recorded temperature, which occurred at Barstow on July 14, 1972, is 116 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Figure 1. Most of the year, flow in most of the Mojave River is underground.

The total annual precipitation is 4 inches at Barstow and 5 inches at Victorville. Of this, 30 percent usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 2.33 inches at Victorville on September 11, 1976. Thunderstorms occur on about 3 days each year, and most occur in summer.

The average seasonal snowfall is 1 inch at Barstow and 2 inches at Victorville. The greatest snow depth at any one time during the period of record was 8 inches at Barstow and 17 inches at Victorville. Days when there is snow on the ground are rare, and the number of such days varies from year to year.

The average relative humidity in midafternoon is about 20 percent. Humidity is higher at night, and the average at dawn is about 50 percent. Percentage of possible sunshine is 90 percent of the time in summer and 60 percent in winter.

The prevailing wind is from the west. Average windspeed is highest, 8 miles per hour, in summer. The highest recorded windspeed is 87.4 miles per hour. Strong, dry winds come from varying directions throughout the year (fig. 2).

A windspeed of more than 12 miles per hour is sufficient to lift and carry sand. Figure 3 shows that the windspeed exceeds 12 miles per hour an average of 36 percent of the year, as recorded at the Daggett Airport Station. The highest percentage of time (45 to 65 percent) when windspeed exceeds 12 miles per hour is from March through June. A windspeed of more than 12 miles per hour occurs on an average of 28 percent of the year in Apple Valley and 22 percent of the year at George Air Force Base in Victorville. The direction of these winds varies with location. Figure 4 shows that most of the erosive winds at Daggett come generally from the west and that most of the erosive winds at

Month	Direction	Speed (mph)	Year
January	South	62.1	1952
February	West	51.8	1953
March	South-southeast	71.3	1954
April	South-southeast	56.3	1951
May	West-northwest	56.3	1961
June	West	87.4	1959
July	North	57.5	1960
August	Southeast	40.3	1960
September	South	43.7	1960
October	Northeast	50.6	1961
November	Southeast	58.6	1951
December	North	64.4	1953

Figure 2. Gusts from 40 to 87 miles per hour can blow from any direction any month of the year.

George Air Force Base come generally from the south and west.

The climate in the southern part of the survey area is somewhat different from that described for the Barstow and Victorville areas. South of Victorville, the total annual precipitation increases and is about 6 to 9 inches in Phelan and Hesperia (*24*). Farther south, the precipitation increases to about 25 inches in the mountains at the southern boundary of the survey area. One-fourth to one-half of the precipitation in the mountains is in the form of snow.

An air-drained thermal belt is above the cold valley floors along the southern edge of the survey area (*19*). This belt is along the side slopes of the alluvial fans and terraces at the base of the San Gabriel and San Bernardino Mountains. It extends from an area near the base of the mountains to 4 miles north of Phelan, 2 miles north of Hesperia, and 2 miles south of Lucerne Valley. The thermal belt is interrupted by the Mojave River Valley and other valley bottoms that are cooler than the thermal zone. The growing season in areas affected by the thermal belt is slightly longer than the growing season on the valley floors below it. The longer season allows blossoms and young fruit to escape spring frost in most years. These areas are suited to almonds, apricots, grapes, and sweet cherries and to the moderate chilling requirement of peaches and pears.

In areas of mountain uplands, above the thermal belt, the growing season, at 32 degrees F, is 150 to 190 days. The growing season in the Daggett, Yermo, and Newberry areas is slightly longer than it is in the Barstow area.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept or model of how they were formed.

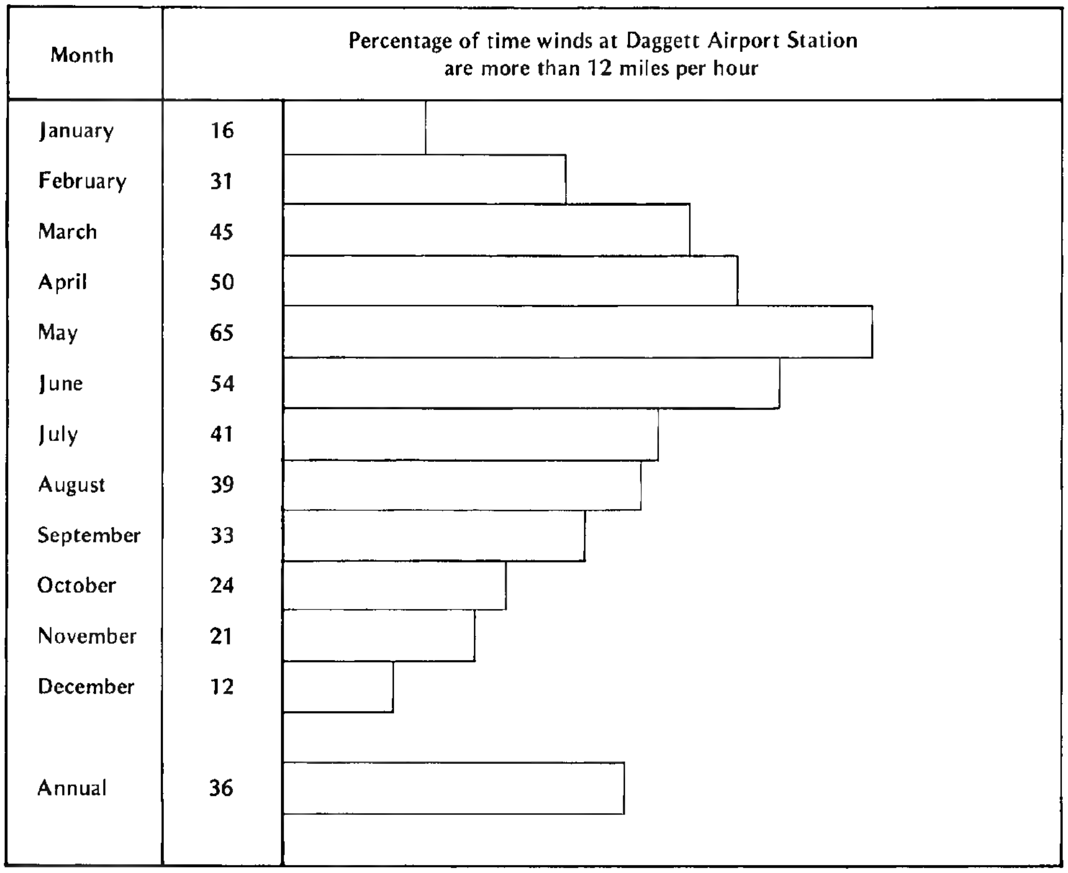

Figure 3. Average monthly percentage of time winds are more than 12 miles per hour; measured at the Daggett Airport Station.

Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge gradually into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While the soil survey was in progress, samples of some of the soils in the area were collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses and under different levels of management. Some interpretations were modified to fit

Direction	Percentage of time winds are more than 12 miles per hour		
	George Air Force Base	Daggett Airport Station	George--black bar; Daggett--white bar
N	1.3	0.5	
NNE	2.4	0.8	
NE	1.8	0.5	
ENE	0.5	0.8	
E	0.9	1.9	
ESE	0.5	1.1	
SE	1.8	0.3	
SSE	7.8	0.0	
S	23.7	0.0	
SSW	12.0	0.5	
SW	6.0	3.5	
WSW	8.8	23.4	
W	22.8	30.2	
WNW	7.8	29.1	
NW	1.4	6.6	
NNW	0.5	0.8	

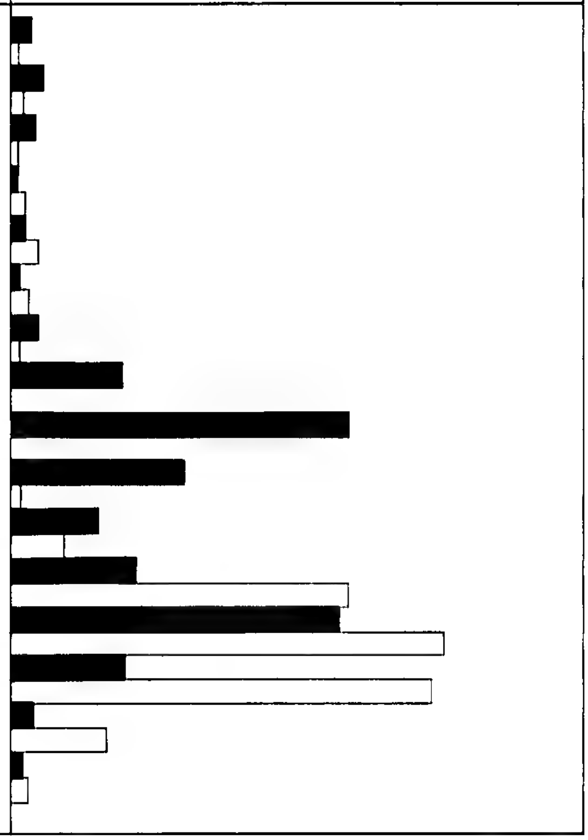

Figure 4. Average annual percentage of time winds of more than 12 miles per hour blow from various directions; measured at George Air Force Base and the Daggett Airport Station.

local conditions, and some new interpretations were developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map with this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general map units in this survey have been grouped into 3 general kinds of landscapes for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages.

Soils of the Mojave Desert on flood plains, alluvial fans, and terraces and in basins

The soils in this group are dominantly in low positions in arid areas throughout the survey area. The slopes are nearly level to strongly sloping. Elevation ranges from about 1,700 feet near Camp Cady to about 4,000 feet north of Phelan. The average annual precipitation ranges from 4 to 6 inches, and the average annual temperature ranges from 61 to 65 degrees F. The average frost-free season ranges from 190 to 250 days, depending on elevation, physiography, and air drainage.

These soils are very deep and shallow and are moderately well drained to somewhat excessively drained. The surface layer is sand, loamy sand, loamy fine sand, sandy loam, loam, and clay.

These soils are used mainly for irrigated crops, homesite development, and wildlife habitat. They are also used for grazing.

There are seven map units in this group. They make up about 64 percent of the survey area.

1. Villa-Riverwash-Victorville

Very deep, nearly level, moderately well drained soils, and Riverwash; on flood plains and low terraces

This map unit is on recent, narrow flood plains and on low terraces along the Mojave River from Deep Creek and West Fork in the south to Camp Cady in the northeastern corner of the survey area. The soils formed in alluvium derived dominantly from granitic material. Elevation ranges from 1,700 to 2,800 feet.

This unit makes up about 3 percent of the survey area. It is about 40 percent Villa soils, 31 percent Riverwash, and 16 percent Victorville soils. The remaining 13 percent is components of minor extent.

Villa soils are on flood plains and on some low river terraces. These soils typically are mainly loamy sand or loamy fine sand, and they have thin strata of sandy loam throughout.

Riverwash consists of sandy soil material in the bed of the Mojave River. There is little or no vegetation. Riverwash is subject to flooding during prolonged rains.

Victorville soils are on low river terraces and, in some areas, on flood plains. These soils typically have a sandy loam surface layer. The substratum is sandy loam and thin strata of loamy sand, sand, and clay loam.

Of minor extent in this unit are the well drained Victorville Variant soils on alluvial fans and in small basins; small areas of Fluvents that have a water table at a depth of less than 5 feet; and Torriorthents, Torripsamments, and Urban land that have been terraced, leveled, or scraped.

Areas of this unit are used mainly for irrigated crops, homesite development, wildlife habitat, or grazing.

The soils in this unit are suited to most of the crops commonly grown in the area. The soils are limited for many uses by a moderate to high hazard of soil blowing.

Because of the hazard of flooding, this unit is poorly suited to homesite development.

If the soils in this unit are used for grazing, they are limited by low precipitation and rare periods of flooding. These limitations prevent the establishment of palatable forage. Generally, forage is limited to riparian shrubs and trees and spring annuals.

This unit provides openland habitat for wildlife such as hawks, owls, mourning dove, coyote, desert cottontail, ground squirrels, and mice. Maintaining existing water-associated vegetation such as cottonwoods and willows

is beneficial to wildlife. Where large areas of land are devoted to intensive agriculture, windbreaks enhance wildlife habitat.

2. Rosamond-Lavic-Cave

Very deep and shallow, nearly level and gently sloping, well drained and moderately well drained soils; on basin rims and low alluvial fans

This map unit is in areas adjacent to playas in intermontane basins mainly in Lucerne Valley, near El Mirage and Barstow. The soils formed in alluvium derived dominantly from granitic material. Elevation ranges from 1,700 to 3,100 feet.

This unit makes up about 2 percent of the survey area. It is about 38 percent Rosamond soils, 21 percent Lavic soils, and 16 percent Cave soils. The remaining 25 percent is components of minor extent.

Rosamond soils are on alluvial fans and basin rims. They are very deep and well drained. Slope ranges from 0 to 2 percent. Typically, the profile is loam and clay loam to a depth of 40 inches or more. Below this, it is loamy fine sand and loamy sand. These soils typically are saline-alkali.

Lavic soils are on alluvial fans and basin rims. They are very deep and moderately well drained. Slope ranges from 0 to 5 percent. Typically, the upper part of the profile is loamy fine sand and loamy sand. It is underlain by weakly and discontinuously lime-cemented layers of sandy loam and loam. Below this is loamy sand.

Cave soils are on low alluvial fans. They are shallow and well drained. Slope ranges from 0 to 2 percent. Typically, the upper part of the profile is loam that is underlain by a strongly lime-cemented hardpan. The substratum is calcareous loam and sand. Depth to the hardpan is 14 to 20 inches.

Of minor extent in this unit are the well drained Lovelace and Yermo soils that are on alluvial fans and are near Lavic soils. Lovelace soils have a massive or very weakly lime-cemented layer of loamy sand. Also included are the moderately well drained Peterman soils on basin rims.

Areas of this unit are used mainly as wildlife habitat or for grazing. A few areas are used for homesite development or irrigated crops.

The soils in this unit are limited for many uses by a very low to moderate available water capacity, the lime-cemented layers, and the content of salts and alkali. The Cave and Rosamond soils are poorly suited to irrigated crops. The Rosamond soils are limited by the content of salts and alkali and rare periods of flooding. Reclamation is needed if crops are grown.

If the soils in this unit are used for homesite development, they are limited by the hazards of flooding and soil blowing and the high content of lime. The Cave soils are limited by shallowness.

If the soils in this unit are used for grazing, they are limited by low precipitation. Forage is limited to spring annuals and shrubs.

This unit provides rangeland habitat for wildlife including bobcats, black-tailed jackrabbits, kangaroo rats, owls, thrashers, and reptiles. This unit generally is poorly suited to improvement of rangeland wildlife habitat. Maintenance of existing vegetation is a suitable wildlife management practice. Watering facilities and plantings for food and cover are beneficial to wildlife such as quail and desert cottontail.

3. Playas-Bousic

Playas, and very deep, nearly level, moderately well drained soils; in basins

This map unit is on internally drained intermontane basin floors and rims, mainly in Lucerne Valley and other closed basins in the survey area. The soils formed in fine-textured alluvium derived from mixed sources. Elevation ranges from about 1,750 to 3,100 feet.

This unit makes up about 3 percent of the survey area. It is about 62 percent Playas and 24 percent Bousic soils. The remaining 14 percent is components of minor extent.

Playas consists of undrained flats in closed basins. They are barren of vegetation and are strongly saline-alkali. Areas are flooded for short periods after high intensity rain. The water is not absorbed and remains until it evaporates.

Bousic soils are on basin rims. Typically, the profile is clay throughout. The upper part is strongly saline-alkali.

Of minor extent in this unit are the moderately well drained Glendale Variant and Peterman soils on basin rims and lower margins of alluvial fans. These soils are saline-alkali. Also included are the well drained Manet soils on alluvial fans.

Areas of this unit are used mainly as wildlife habitat. Small areas are used for grazing, irrigated crops, or homesite development.

This unit is poorly suited to irrigated crops. If the unit is used for homesite development, it is limited by the hazard of flooding, high content of salts and alkali, fine texture, high shrink-swell potential, and slow permeability.

If this unit is used for grazing, the main limitation is the high content of salts and alkali, which drastically reduces forage production.

This unit provides habitat for hawks, black-tailed jackrabbits, rodents, and reptiles. Wildlife habitat improvement is very difficult on this unit because of the hazard of flooding and high content of salts and alkali. Existing vegetation such as shadscale and desert blite provide habitat for some wildlife.

4. Halloran-Cajon, loamy substratum-Norob

Very deep, nearly level and gently sloping, moderately

well drained, somewhat excessively drained, and well drained soils; on terraces and alluvial fans

This map unit is on alluvial fans and river terraces. It is adjacent to playas in the intermontane basin area near Harper Lake and in the Mojave Valley near Newberry Springs and Harvard Hill. The soils formed in alluvium derived dominantly from granitic material. Elevation ranges from 1,800 to 2,500 feet.

This unit makes up about 9 percent of the survey area. It is about 35 percent Halloran soils, 29 percent Cajon, loamy substratum, soils, and 28 percent Norob soils. The remaining 8 percent is components of minor extent.

Halloran soils are on river terraces and are moderately well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is sand. The subsoil is sandy loam. Below this is loamy sand and strata of sandy loam and loamy fine sand.

Cajon, loamy substratum, soils are on alluvial fans and river terraces. These soils are somewhat excessively drained. Slope ranges from 0 to 2 percent. Typically, the soil is loamy sand and sand. Thin to thick strata of sandy loam to clay loam are below a depth of 40 inches.

Norob soils are on river terraces. These soils are well drained. Slope ranges from 0 to 5 percent. Typically, the surface layer is loamy sand. The subsoil is sandy clay loam and clay loam, and the substratum is strata of loamy sand and fine sandy loam.

Of minor extent in this unit is Dune land. Dune land is mainly in areas adjacent to Harper Lake and on terraces in the Mojave Valley.

Areas of this unit are used mainly as wildlife habitat. A few small areas are used for irrigated crops, grazing, or homesite development.

Cajon soils are suited to the irrigated crops commonly grown in the area and to homesite development. Halloran and Norob soils are poorly suited to irrigated crops. They are limited for many uses by the high content of salts and alkali, the hazard of soil blowing, the very low to moderate available water capacity, and the slow to moderately slow permeability. Reclamation of these soils is difficult and costly because high quality water for leaching is not readily available.

If this unit is used for grazing, it is are limited by low precipitation. Forage is limited to spring annuals and shrubs.

This unit provides rangeland habitat for coyote, ground squirrels, owls, wrens, and reptiles. Cajon soils have fair potential for rangeland habitat improvement. Existing vegetation such as creosotebush and white bursage can be maintained to provide wildlife habitat.

5. Cajon-Manet

Very deep, nearly level to strongly sloping, somewhat excessively drained and well drained soils; on recent alluvial fans

This map unit is on narrow to broad or coalescing alluvial fans throughout the survey area. Manet soils are on only the broad alluvial fans between the base of the San Gabriel Mountains near Phelan and extending to El Mirage Lake. Cajon soils formed in granitic alluvium. Manet soils formed in alluvium derived dominantly from dark-colored micaceous minerals. Elevation ranges from 1,800 to about 4,000 feet.

This unit makes up about 30 percent of the survey area. It is about 78 percent Cajon soils and 13 percent Manet soils. The remaining 9 percent is components of minor extent.

Cajon soils are somewhat excessively drained. Slope ranges from 0 to 15 percent. Typically, the profile is sand and loamy sand throughout. There are strata of gravelly sand in the lower part of the profile. In some areas the soils are gravelly sand throughout.

Manet soils are well drained. Slope ranges from 0 to 9 percent. Typically, the profile is sand and loamy sand and strata of fine sandy loam.

Of minor extent in this unit are the excessively drained Arizo soils on the upper parts of alluvial fans. These soils are very gravelly and are as much as 60 percent coarse fragments.

Areas of this unit are used mainly for wildlife habitat, grazing, irrigated crops, or homesite development.

The major soils in this unit are suited to the irrigated crops commonly grown in the area. Limitations include low to moderate available water capacity, the hazard of soil blowing, a high water intake rate, and low fertility. If the Manet soils and the gravelly Cajon soils are used for homesite development, the main limitation is the hazard of flooding. Homesite development is rapidly increasing in areas of this unit because major roads provide access to larger communities in southern California.

If this unit is used for grazing, the main limitation is low precipitation. Generally, forage is limited to spring annuals. Indian ricegrass, a perennial grass, is also available in some areas.

This unit provides habitat for coyote, ground squirrels, owls, wrens, and reptiles. Existing vegetation such as creosotebush and white bursage can be maintained to provide wildlife habitat.

6. Kimberlina-Wasco

Very deep, nearly level and gently sloping, well drained soils; on alluvial fans

This map unit is on intermontane alluvial fans near Rabbit Lake and Lucerne Lake. Kimberlina soils formed in alluvium derived from mixed sources. Wasco soils formed in alluvium derived dominantly from granitic material. Elevation ranges from 1,800 to about 4,000 feet. A few small areas of Kimberlina gravelly sandy loam are at an elevation of more than 4,000 feet.

This unit makes up about 4 percent of the survey area. It is about 51 percent Kimberlina soils and 43 percent Wasco soils. The remaining 6 percent is components of minor extent.

Kimberlina soils have slopes of 0 to 9 percent. Typically, the surface layer is loamy fine sand. The underlying material is calcareous sandy loam and loam. In a few small areas the soil is gravelly sandy loam throughout.

Wasco soils have slopes of 0 to 5 percent. Typically, the profile is sandy loam throughout. It is noncalcareous to a depth of 30 to 40 inches and is slightly calcareous below.

Of minor extent in this unit are the somewhat excessively drained Cajon soils on alluvial fans.

This unit is used mainly for wildlife habitat, grazing, or homesite development. A few areas are used for irrigated crops.

The major soils in this unit are suited to the irrigated crops commonly grown in the area. They are limited by the hazard of soil blowing, the high water intake rate, and low fertility. This unit is suited to homesite development. The hazard of soil blowing is the main limiting factor.

If this unit are used for grazing, the main limitation is low precipitation. Generally, forage is limited to spring annuals. Indian ricegrass, a perennial grass, is also available in some areas.

This unit provides habitat for mourning dove, thrashers, black-tailed jackrabbit, fox, and reptiles. Potential is fair for improvement of rangeland wildlife habitat. Small areas of irrigated cropland provide valuable habitat for wildlife including mourning dove and meadowlark. Maintenance of existing desert plants adjacent to irrigated fields is beneficial to wildlife.

7. Bryman-Helendale

Very deep, nearly level to strongly sloping, well drained soils; on alluvial fans and terraces

This map unit is on alluvial fans and terraces that are remnants of a formerly transversely level area of the Cajon Fan. The convex interfluvial terraces and fans are dissected by drainageways. The soils are in Apple Valley, west of the Mojave River between Hesperia and Helendale, and west of Adelanto. The soils formed in alluvium derived dominantly from granitic material. Elevation ranges from 2,500 to 4,000 feet.

This unit makes up about 13 percent of the survey area. It is about 68 percent Bryman soils and 25 percent Helendale soils. The remaining 7 percent is components of minor extent.

Bryman soils are mainly on interfluvial terraces. Slope ranges from 0 to 15 percent. Typically, the surface layer is loamy fine sand. The subsoil is sandy clay loam, and the substratum is loamy sand and sand.

Helendale soils are on alluvial fans and terraces. Slope ranges from 0 to 5 percent. Typically, the surface layer is loamy sand. The subsoil and substratum are sandy loam.

Of minor extent in this unit are the somewhat excessively drained Cajon soils on alluvial fans, the well drained Mohave Variant soils on terraces, Haplargids and Calciorthids on terrace escarpments, dissected hills, and terrace remnants along the Mojave River channel, and Badland on terrace escarpments.

Areas of this unit are used mainly for irrigated crops, pasture, wildlife habitat, or grazing. A few small areas are used for homesite development.

The major soils in this unit are suited to irrigated crops. The main limitations include the high water intake rate, low fertility, and the hazard of soil blowing. These soils are also suited to homesite development. The main limitations for the Bryman soils are moderate shrink-swell potential, low strength, moderately slow permeability, and the hazard of contamination of ground water. Homesite development is rapidly increasing in areas of this unit because the major roads provide access to large communities in southern California.

If the soils in this unit are used for grazing, the main limitation is low precipitation. Generally, forage is limited to spring annuals and shrubs. Indian ricegrass, a perennial grass, is also available in some areas.

This unit provides habitat for owls, wrens, bobcats, rodents, and reptiles. In areas converted to homesites or used for farming, windbreaks are of value to wildlife. Watering facilities and plantings for food and cover are beneficial to wildlife such as quail and hawks.

Soils of the Mojave Desert on old terraces that have a desert pavement and on alluvial fans, hills, and mountains

The soils in this group are dominantly on scattered, rocky desert uplands and on adjacent high terraces in the central and northern parts of the survey area. The slopes are gently sloping to steep. Elevation ranges from about 1,800 feet in an area west of Camp Cady to about 4,500 feet on Goat Mountain. The average annual precipitation ranges from 4 to 6 inches, and the average annual temperature ranges from 61 to 65 degrees F. The average frost-free season ranges mainly from 210 days on the rugged desert uplands near an elevation of 4,000 feet to 250 days on old terraces that have a desert pavement of varnished pebbles and cobbles.

These soils are very shallow, shallow, moderately deep, and very deep. They are well drained. The surface layer is gravelly sand, very gravelly sand, cobbly sandy loam, gravelly sandy loam, sandy loam, and loam.

These soils are used mainly as wildlife habitat and for grazing. They are also used for recreation and as a source of gravel.

There are four map units in this group. They make up about 27 percent of the survey area.

8. Mirage-Joshua

Very deep and moderately deep, gently sloping to strongly sloping, well drained soils that have a desert pavement; on old terraces

This map unit is on old dissected terraces adjacent to rocky desert uplands, mainly in Stoddard Valley, south and east of Helendale, and in an area between Hodges Road and Sidewinder Road extending northwest to the Mojave River. The soils formed in alluvium. Elevation ranges from 2,600 to 3,400 feet.

This unit makes up about 8 percent of the survey area. It is about 54 percent Mirage soils and 41 percent Joshua soils. The remaining 5 percent is components of minor extent.

Mirage soils are very deep. Slope ranges from 2 to 5 percent. Typically, the surface is covered by a desert pavement of varnished pebbles and cobbles. The surface layer is sandy loam, and the subsoil is sandy clay loam and gravelly sandy loam. The substratum is gravelly loamy sand.

Joshua soils are moderately deep. Slope ranges from 2 to 15 percent. Typically, the surface is covered by a desert pavement of varnished pebbles and cobbles. The surface layer is loam, and the subsoil is gravelly sandy clay loam and gravelly sandy loam. The substratum is very gravelly coarse sandy loam, very gravelly loamy coarse sand. Nonindurated, thin, silica-cemented lenses are below a depth of 20 inches.

Of minor extent in this unit are the well drained Nebona and Cuddeback soils, which have an indurated, silica-cemented hardpan. These soils are on terraces and alluvial fans.

Areas of this unit are used mainly as wildlife habitat or for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the barren areas of desert pavement.

This unit provides habitat for wildlife including coyote and owls and rodents and reptiles that burrow near the base of plants. Existing vegetation provides food and cover for these reptiles and rodents. Potential for improving wildlife habitat is poor or very poor.

9. Nebona-Cuddeback

Shallow and moderately deep, gently sloping and moderately sloping, well drained soils that have a desert pavement; on old terraces and alluvial fans

This map unit is on old stable and remnant terraces and fans that have been dissected by drainageways. It is southwest of Barstow and south of Daggett and Newberry Springs. The soils formed in alluvium. Elevation ranges from 1,800 to 3,400 feet.

This unit makes up about 3 percent of the survey area. It is about 67 percent Nebona soils and 28 percent Cuddeback soils. The remaining 5 percent is components of minor extent.

Nebona soils are shallow. Slope ranges from 2 to 9 percent. Typically, the surface is covered by a desert pavement of varnished pebbles and cobbles. The surface layer is sandy loam. The next layer is fine sandy loam. Below this is an indurated, silica-cemented pan at a depth of 6 to 14 inches. The substratum is stratified gravelly sand to loam.

Cuddeback soils are moderately deep. Slope ranges from 2 to 9 percent. Typically, the surface is covered by a desert pavement of varnished pebbles and cobbles. The surface layer is sandy loam, and the subsoil is gravelly sandy clay loam and gravelly sandy loam. Below this is an indurated, silica-cemented pan at a depth of 20 to 40 inches.

Of minor extent in this unit is the somewhat excessively drained Cajon gravelly sand on narrow alluvial fans between terraces.

Areas of this unit are used mainly as wildlife habitat. Some areas are used for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the barren areas of desert pavement.

This unit provides habitat for wildlife such as bobcats and hawks and for rodents and reptiles that burrow near the base of plants. Existing vegetation provides food and cover for these reptiles and rodents. Potential for improving wildlife habitat is poor or very poor.

10. Yermo-Kimberlina-Typic Haplargids

Very deep, gently sloping to steep, well drained soils; on alluvial fans and hills

This map unit is southeast of Barstow. It is on alluvial fans near Pitzer Buttes and on old, deeply dissected and eroded terraces. The fans have broad, smooth, and commonly undulating slopes, and the terraces form hills that have steep, convex slopes. Elevation ranges from 2,400 to 4,100 feet. A few small areas of Yermo and Kimberlina soils on fans adjoining the San Bernardino Mountains have an average frost-free season ranging from 190 to 250 days.

This unit makes up about 2 percent of the survey area. It is about 56 percent Yermo soils, 19 percent Kimberlina soils, and 15 percent Typic Haplargids. The remaining 10 percent is components of minor extent.

Yermo soils are on alluvial fans and hills. Slope ranges from 5 to 50 percent. Typically, the surface layer is cobbly sandy loam. The underlying material is calcareous gravelly sandy loam and very gravelly sandy loam. The underlying material is as much as 60 percent gravel and 15 percent cobbles.

Kimberlina soils are on alluvial fans. Slope ranges from 2 to 9 percent. Typically, the soil is calcareous sandy loam and loam and is 0 to 25 percent pebbles and cobbles.

Typic Haplargids are on hills. Slope ranges from 8 to 15 percent. Typically, 70 to 90 percent of the surface is covered by a desert pavement of varnished gravel and cobbles. The surface layer ranges from gravelly sand to gravelly sandy loam, and the subsoil ranges from sandy loam to very gravelly sandy clay loam. The substratum ranges from gravelly sand to very gravelly loamy sand.

Of minor extent in this unit are the excessively drained Arizo soils on alluvial fans, somewhat excessively drained Cajon soils on alluvial fans, well drained Cuddeback soils on terraces and alluvial fans, and well drained Mirage and Nebona soils on terraces. Also included is Badland on escarpments and in deeply dissected drainageways.

Areas of this unit are used mainly as wildlife habitat, for recreation, or as a source of gravel for construction. Small areas are used for grazing.

If this unit is used for grazing, the main limitation is low precipitation. Forage is limited to spring annuals and shrubs.

This unit provides habitat for wildlife such as gray fox, ground squirrels, thrashers, wrens, and numerous reptiles. Kimberlina soils generally have fair potential for growing wild herbaceous vegetation. Windbreaks, watering facilities, and plantings for food and cover are beneficial for wildlife. Yermo soils and Typic Haplargids have poor or very poor potential for improving wildlife habitat. Existing vegetation provides food and cover for reptiles and rodents.

11. Rock outcrop-Lithic Torriorthents-Sparkhule

Rock outcrop, and very shallow and shallow, moderately steep and steep, well drained soils; on desert hills and mountains

This map unit is on rocky ridges and hills and prominent uplands that rise abruptly from the desert landscape. These desert uplands are scattered throughout the central and eastern parts of the survey area as isolated outcrops and as groups of hills or mountains. The soils formed mainly in residuum derived from granitic and volcanic rock. Elevation ranges from about 2,100 to 4,500 feet. A few small areas of Sparkhule soils have an average frost-free season ranging from 190 to 210 days in areas above an elevation of 4,000 feet.

This unit makes up about 14 percent of the survey area. It is about 54 percent Rock outcrop, 23 percent Lithic Torriorthents, and 17 percent Sparkhule soils. The remaining 6 percent is components of minor extent.

Rock outcrop is on foothills and mountains. It consists of exposed igneous, metamorphic, or sedimentary rock that includes little or no soil material. The kinds of rock include granite, quartz monzonite, basalt, dacite, limestone, quartz mica schist, and fanglomerate.

Lithic Torriorthents are on hills and mountains. Slope ranges from 15 to 50 percent. The soil varies from sandy loam to very gravelly sand throughout. Depth to hard fractured granite ranges from 1 to 18 inches.

Sparkhule soils are on foothills. Slope ranges from 15 to 50 percent. Typically, the surface layer is gravelly sandy loam and the subsoil is gravelly sandy clay loam and sandy clay loam. Depth to hard volcanic rock ranges from 14 to 20 inches.

Of minor extent in this unit are the well drained Trigger soils on foothills.

Areas of this unit are used mainly used as wildlife habitat or for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the barren areas. Generally, forage is limited to spring annuals and shrubs.

Rock outcrop provides excellent denning and nesting habitat for numerous animals and reptiles. This unit is poorly suited to wildlife habitat development. Maintenance of existing vegetation is a suitable wildlife habitat management practice.

Soils of the San Gabriel and San Bernardino Mountains on mountains, foothills, alluvial fans, and terraces

Most of the soils in this group are on mountains and foothills and in adjacent high positions along the southern boundary of the survey area. The slopes are gently sloping to steep. Elevation ranges from 3,400 feet in western Summit Valley to 6,200 feet in the mountains near the San Bernardino National Forest boundary. The average annual precipitation ranges from 9 to 25 inches, and the average annual temperature ranges from 52 to 60 degrees F. The average frost-free season ranges from 150 days in the mountains along the National Forest boundary to 190 days in Summit Valley. The growing season on high alluvial fans that have good air drainage is slightly longer.

Also in this group is a map unit of Hesperia and Lucerne soils. This unit has climatic features that are transitional to those of the other map units in this group and to those of the two groups of the Mojave Desert. This map unit is on high alluvial fans and terraces. It is nearly level and gently sloping. Elevation ranges from 2,900 feet northwest of Hesperia to 4,000 feet near Baldy Mesa. The average annual precipitation ranges from 6 to 9 inches, and the average annual temperature ranges from 60 to 63 degrees F. The average frost-free season ranges from 190 days to 240. Air drainage is good.

The soils in this group are moderately deep and very deep and are well drained and somewhat excessively drained. The surface layer is sandy loam and loamy fine sand.

These soils are used mainly as wildlife habitat and for grazing and homesite development. They are also used for irrigated crops and pasture.

There are four units in this group. They make up about 9 percent of the survey area.

12. Arrastre-Rock outcrop-Crafton

Moderately deep, steep, well drained soils, and Rock outcrop; on foothills and mountains

This map unit is on foothills of the San Bernardino Mountains, near Grapevine Canyon, near Arrastre

Canyon, and along Oak Springs Ranch Road, and on mountains near the San Bernardino National Forest boundary, along the southern edge of the survey area. The soils formed in residuum derived from granitic rock. Elevation ranges from 3,400 to 6,200 feet.

This unit makes up about 2 percent of the survey area. It is about 31 percent Arrastre soils, 25 percent Rock outcrop, and 24 percent Crafton soils. The remaining 20 percent is components of minor extent.

Arrastre soils are on upland foothills. Slope ranges from 30 to 50 percent. Typically, the surface layer is sandy loam and the subsoil is gravelly sandy loam. Depth to hard, broken granitic rock ranges from 20 to 40 inches.

Rock outcrop is on foothills and mountains. It consists of exposed igneous rock that includes little or no soil material. The kinds of rock include quartz monzonite, granodiorite, granite, and small areas of diorite and gabbro.

Crafton soils are on mountains, mainly on north aspects. Slope ranges from 30 to 50 percent. Typically, the surface layer is sandy loam. The underlying material is sandy loam and gravelly sandy loam. Depth to shattered, weathered granitic rock ranges from 20 to 40 inches.

Of minor extent in this unit are the well drained Cushenbury soils and somewhat excessively drained Sheephead soils on ridgetops, knolls, and side slopes.

This unit is used mainly as wildlife habitat or for grazing.

If this unit is used for grazing, the main limitations are the generally rugged terrain and the small dense areas of shrubs and trees. Primary forage is desert needlegrass, bluegrass, and shrubs.

This unit provides habitat for wildlife including fox, ground squirrels, thrashers, wrens, and reptiles. Potential for development of rangeland wildlife habitat is fair. Existing vegetation, such as California juniper and filaree, provides cover and food for wildlife.

13. Gullied land-Haploxeralfs-Bull Trail

Gullied land, and very deep, gently sloping to moderately steep, well drained soils; on alluvial fan remnants and terraces

This map unit is on broad to narrow, old alluvial fan remnants and terraces that have been uplifted and deeply dissected. It is in the southwestern part of the survey area and is bordered on the south by the Inface Bluffs, along Cajon Creek, and the mountainous uplands of the San Bernardino National Forest. The soils formed in old mixed alluvium derived dominantly from granitic material. Elevation ranges from about 3,800 to 5,000 feet.

This unit makes up about 3 percent of the survey area. It is about 27 percent Gullied land, 27 percent Haploxeralfs, and 22 percent Bull Trail soils. The remaining 24 percent is components of minor extent.

Gullied land is on remnants of alluvial fans. It consists of areas where intermittent streams have become deeply entrenched, and the soil profile has been nearly destroyed. Slope is undulating or gently rolling and ranges from 2 to 9 percent.

Haploxeralfs are on remnants of alluvial fans. Slope ranges from 10 to 30 percent. The soils are severely eroded. In some places the surface layer is sandy loam. The subsoil is thin to thick sandy clay loam or sandy loam.

Bull Trail soils are on terraces and remnants of alluvial fans. Slope ranges from 15 to 30 percent. Typically, the surface layer is sandy loam and the subsoil is thick sandy clay loam and sandy loam.

Of minor extent in this unit are the well drained Wrightwood soils on terraces, somewhat excessively drained Avawatz soils along lower alluvial fans and stream channels, somewhat excessively drained to well drained Typic Xerorthents on steep side slopes, cuestas, and hogbacks, and Badland on escarpments.

This unit is used mainly as wildlife habitat or for grazing. A few small areas are used as homesites.

This unit is limited for many uses by the hazard of erosion, steepness of slope, and moderately slow to moderate permeability.

If this unit is used for grazing, the main limitations are the severe hazard of erosion, rugged terrain, and small, dense areas of shrubs and trees. The Bull Trail soils of this unit are suited to grazing. Primary forage is desert needlegrass, bluegrass, and shrubs.

This unit provides habitat for wildlife such as fox, black-tailed jackrabbit, mice, quail, sparrows, and reptiles. Bull Trail soils have good potential for development of rangeland wildlife habitat. Because of the variability of the areas of Gullied land and Haploxeralfs, onsite investigation is needed to determine suitable areas for wildlife habitat development.

14. Avawatz-Oak Glen

Very deep, gently sloping and moderately sloping, somewhat excessively drained and well drained soils; on alluvial fans and stream terraces

This map unit is in incised drainageways on alluvial fans between alluvial fan remnants and on stream terraces in upland stream valleys in the southwestern part of the survey area, including Summit Valley, Antelope Valley, and Horsethief Canyon. It is bordered on the south by the San Bernardino National Forest. Elevation ranges from about 3,400 to 5,200 feet.

This unit makes up about 1 percent of the survey area. It is about 42 percent Avawatz soils and 35 percent Oak Glen soils. The remaining 23 percent is components of minor extent.

Avawatz soils are in intermittent drainageways on alluvial fans. They are somewhat excessively drained. Slope ranges from 2 to 9 percent. Typically, the surface

layer is sandy loam. The underlying material is loamy sand and thin strata of sandy loam.

Oak Glen soils are on the upper parts of alluvial fans and stream terraces. These soils are well drained. Slope ranges from 2 to 9 percent. Typically, the profile is sandy loam throughout.

Of minor extent in this unit are the excessively drained Soboba soils and well drained Hanford soils and the somewhat excessively drained Tujunga soils on high alluvial fans in the extreme southeastern part of the survey area.

Areas of this unit are used mainly as wildlife habitat or for grazing. A few small areas are used for irrigated pasture and homesite development.

If this unit is used for homesite development or irrigated crops, the main limitations include the hazards of soil blowing and water erosion and slope. The short growing season is a limitation for some crops.

If this unit is used for grazing, the main limitations are the generally rugged terrain and small thickets. Primary forage is desert needlegrass, bluegrass, and shrubs.

This unit provides habitat for wildlife such as coyote, ground squirrels, kangaroo rats, hawks, thrushes, and reptiles. The potential for developing rangeland wildlife habitat is fair to good. Vegetation such as scrub oak, chamise, and desert needlegrass provides food and cover for wildlife.

15. Hesperia-Lucerne

Very deep, nearly level and gently sloping, well drained soils; on high alluvial fans and terraces

This map unit is mainly on broad high fans west and east of Hesperia and on terraces on Baldy Mesa. The soils formed in alluvium derived dominantly from granitic material. Elevation ranges from about 2,900 to 4,000 feet.

This unit makes up about 3 percent of the survey area. It is about 56 percent Hesperia soils and 33 percent Lucerne soils. The remaining 11 percent is soils of minor extent.

Hesperia soils are on alluvial fans. Slope ranges from 2 to 5 percent. Typically, the surface layer is loamy fine sand. The underlying material is sandy loam.

Lucerne soils are on alluvial fans and terraces. Slope ranges from 0 to 5 percent. Typically, the profile is sandy loam.

Of minor extent in this unit are the somewhat excessively drained Cajon soils on alluvial fans, well drained Helendale soils on fans, and well drained Wrightwood and Bull Trail soils on terraces.

Areas of this unit are used mainly as wildlife habitat, for grazing, or for homesite development. A few small areas are used for irrigated crops.

If the soils in this unit are used for homesite development or irrigated crops, the main limitations are the hazard of soil blowing, low fertility, and an inadequate supply of irrigation water. Homesite development is rapidly increasing on this unit. It is readily accessible by major roads that lead to large communities in southern California.

Forage on this unit generally is limited to spring annuals and shrubs. Desert needlegrass, a perennial grass, is in some areas.

This unit provides habitat for wildlife including foxes, ground squirrels, thrashers, wrens, and reptiles. Potential for rangeland wildlife habitat development is fair. Existing vegetation such as California juniper and filaree provides cover and food for wildlife.

Detailed Soil Map Units

The map units delineated on the detailed maps with this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavior divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation to precisely define and locate the soils and miscellaneous areas is needed.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Cajon sand, 9 to 15 percent slopes, is one of several phases in the Cajon series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or associations.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Nebona-Cuddeback complex, 2 to 9 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or

miscellaneous areas are somewhat similar. Avawatz-Oak Glen association, gently sloping, is an example.

Most map units include small scattered areas of soils or miscellaneous areas other than those for which the map unit is named. Some of these included areas have properties that differ substantially from those of the major soils or miscellaneous areas. Such differences could significantly affect use and management of the map unit. The included soils as well as miscellaneous areas are identified in each map unit description. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Playas is an example.

This survey was mapped at two levels of detail. At the most detailed level, map units are narrowly defined. This means that map unit boundaries were plotted and verified at closely spaced intervals. At the less detailed level, map units are broadly defined. Boundaries were plotted and verified at wider intervals. The broadly defined units are indicated by an asterisk in the map legend. The detail of mapping was selected to meet the anticipated long-term use of the survey, and the map units were designed to meet the needs for that use.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

100 Arizo gravelly loamy sand, 2 to 9 percent slopes. This very deep, excessively drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are long, smooth, convex, and gently sloping to moderately sloping. Most areas are dissected by deep intermittent drainageways at the head of alluvial fans. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 1,900 to 3,300 feet.

Typically, the upper part of this soil is very pale brown gravelly loamy sand about 15 inches thick. Below this to a depth of 60 inches or more is pale brown very gravelly loamy coarse sand. In some areas of similar included soils, the upper part of the soil is gravelly sand.

Included in this unit are small areas of Cajon gravelly sand, Yermo soils, and Kimberlina soils on fans. Also included are small areas of soils that are similar to this Arizo soil but are gravelly below a depth of 15 inches and small areas that are covered with stones and cobbles.

Permeability of this Arizo soil is very rapid. Available water capacity is low. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more. The soil is subject to occasional, very brief periods of flooding.

This unit is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Major forage species are desert needlegrass, red brome, and filaree.

If this unit is used for homesite development, the main limitations are the hazard of flooding, the content of gravel, cobbles, and stones, the very rapid permeability, and the low available water capacity. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding.

Because of the very rapid permeability, septic tank absorption fields function well; however, unfiltered effluent can contaminate the ground water (fig. 5).

As much of the existing natural vegetation as feasible should be left around homesites. Windbreaks can be used around homesites to provide protection from the wind. Trees suitable for use in windbreaks include Arizona cypress and Athel. Establishment of landscaping plants is limited by the content of gravel, cobbles, and stones in the soil and by the low available water capacity. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This unit is in capability subclass VIIs (30), nonirrigated.

101 Arrastre-Rock outcrop complex, 30 to 50 percent slopes. This map unit is on upland foothills. The natural vegetation is mainly juniper, desert shrubs, grasses, and forbs. Elevation is 4,100 to 5,000 feet.

This unit is 60 percent Arrastre sandy loam and 20 percent Rock outcrop. The Arrastre soil is on hillsides, ridges, and side slopes of rugged upland foothills. Slopes are steep and convex. Slope ranges from 30 to 50 percent. Rock outcrop is on ridges and hillsides. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Crafton sandy loam, Sheephead gravelly sandy loam, and Cushenbury loamy sand on hillsides, knolls, and ridges. In small areas at the head of Grapevine Canyon and at the south end of Milpas Road, there are soils that have a neutral, brownish gray sandy loam surface layer about 8 inches thick over gray or brownish gray sandy loam or loamy coarse sand about 20 inches thick over hard gabbro. In small areas west of Juniper Flats, there are soils that are pale brown gravelly sandy loam about 16 inches thick over hard limestone. Also included in this unit are small areas of soils that are underlain by weathered granitic rock that is easily penetrated by roots and small areas of

Figure 5. Soil profile in an area of Arizo gravelly loamy sand, 2 to 9 percent slopes. Installation of septic tank absorption fields is hindered in areas of this unit where the content of gravel and cobbles ranges from 20 to 60 percent.

soils on the walls of narrow canyons that have slopes of 50 to 60 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Arrastre soil is moderately deep and well drained. It formed in material weathered from granitic rock. Typically, the upper part of the surface layer is brown sandy loam about 6 inches thick and the lower part is brown gravelly sandy loam about 11 inches thick. The subsoil to a depth of 26 inches is yellowish brown gravelly sandy loam over hard, shattered granitic rock. In some areas of similar included soils, the surface layer is gravelly sandy loam and gravelly loamy sand and is 5 to 14 percent clay. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Arrastre soil is moderately rapid. Available water capacity is very low or low. Runoff is medium or rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. Effective rooting depth is 20 to 40 inches.

Rock outcrop consists of exposed areas of granitic rock.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are the hazard of water erosion and the very low or low available water capacity. Grazing is limited to a few weeks in spring when plant growth is at its peak. Brush management that includes properly designed firebreaks, livestock trails, and access roads is necessary to limit wildfires and soil erosion. Natural terrain barriers associated with this unit should be used as livestock management area boundaries. Major forage species are desert needlegrass, bluegrass, and Nevada ephedra.

This map unit is in capability subclass VIIe (20), nonirrigated.

102 Avawatz-Oak Glen association, gently sloping. This map unit is in narrow to broad, deeply incised drainageways and on alluvial fans in upland valleys. Slopes are convex and range from 2 to 9 percent. The natural vegetation is mainly juniper, desert shrubs, grasses, and forbs. Elevation is 3,400 to 5,200 feet.

This unit is 50 percent Avawatz sandy loam and 40 percent Oak Glen sandy loam. The Avawatz soil is in deeply incised intermittent drainageways or on narrow to broad alluvial fans in valleys of intermittent streams. The Oak Glen soil is on the upper parts of alluvial fans near stream valleys.

Included in this unit are small areas of soils that are similar to this Oak Glen soil but have a surface layer that is about 16 to 18 inches thick and are on alluvial fans and small areas of soils in drainageways and on narrow fans that are similar to this Avawatz soil but are sandy throughout or are overwashed by recent sandy, gravelly, or cobbly deposits. There are small areas of an alluvial soil near Oak Springs Ranch road that is dark grayish brown gravelly loamy fine sand. This soil is high in content of mica and has an overwash of cobbles and stones. On the Los Flores Ranch are areas of soils that have a temporary water table at a depth of 24 to 30 inches in small concave areas during the irrigation season. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

The Avawatz soil is very deep and somewhat excessively drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is brown sandy loam about 15 inches thick. The underlying material to a depth of 60 inches or more is pale brown loamy sand that has thin strata of sandy

loam. In some areas of similar included soils, the surface layer is loamy sand.

Permeability of the Avawatz soil is rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

The Oak Glen soil is very deep and well drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is gray sandy loam about 22 inches thick. The underlying material to a depth of 60 inches or more is grayish brown and brown sandy loam. In some areas of similar included soils, the upper 6 inches of the surface layer is loam or loamy sand.

Permeability of the Oak Glen soil is moderately rapid. Available water capacity is moderate or high. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat and for grazing. It is also used for irrigated pasture and homesite development.

If this unit is used for grazing, the main limitation is the hazard of soil blowing. The Avawatz soil is also limited by the low available water capacity. Grazing is limited to a few weeks in spring when plant growth is at its peak. Prescribed burning or thinning increases the production of forage by reducing the competition from California juniper and singleleaf pinyon. Major forage species are desert needlegrass, filaree, and ephedra.

This unit is suited to most climatically adapted crops. It is presently used for irrigated pasture that has yields of 10 to 12 animal-unit-months. The soils in this unit are limited by the hazards of soil blowing and water erosion and by slope. The Avawatz soil is also limited by low available water capacity, and the Oak Glen soil is also limited by the moderate available water capacity. Sprinkler irrigation is better suited to this unit than most other methods because of the slope and restricted available water capacity. Drip irrigation is also suited to orchards. These systems, if properly designed, insure better distribution of water on sloping soils. Irrigation water should be properly managed. Light, frequent applications of water conserve water and keep soil losses to a minimum.

Returning crop residue to the soil and, where feasible leaving stubble on the surface reduce soil blowing and water erosion and increase the organic matter content. New alfalfa seedlings can be protected by fall seeding the alfalfa in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

If this unit is used for orchards, cover crops should be established to reduce water erosion and soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress and aleppo pine.

If this unit is used for homesite development, it is limited by the hazards of water erosion, flooding, and soil blowing. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding.

As much of the existing natural vegetation as feasible should be left around homesites to reduce water erosion and soil blowing. Protective measures such as mulching or seeding are needed to reduce water erosion on construction sites during winter. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used around homesites to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

The Avawatz soil is also limited by the hazard of sloughing. Because of the sandy texture of this soil, cutbanks are not stable and are subject to sloughing.

If the Avawatz soil is used for septic tank absorption fields, the main limitation is the rapid permeability. Septic tank absorption fields function well; because of the rapid permeability, however, unfiltered effluent can contaminate the ground water.

The Avawatz soil is in capability unit IIIe-1 (20), irrigated, and in capability subclass VIe (20), nonirrigated. The Oak Glen soil is in capability unit IIe-1 (20), irrigated, and in capability subclass VIe (20), nonirrigated.

103 Badland. This map unit is on cliffs and bluffs and has steep and very steep slopes. It is dissected by numerous intermittent drainageways that have cut into the more erodible geologic material. It is barren.

Included in this unit are small areas of Cajon sand in drainageways, Rock outcrop and Lithic Torriorthents on uplands, and Nebona sandy loam and Cuddeback sandy loam on terrace remnants.

Runoff is very rapid, and the hazard of water erosion is very high. Geologic erosion is active. Drainage and permeability vary from one area to another. The unit is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat.

This map unit is in capability subclass VIIIe (30), nonirrigated.

104 Bousic clay. This very deep, moderately well drained, nearly level soil is on basin rims. It formed in fine-textured alluvium derived from mixed sources. Slopes are broad and smooth and range from 0 to 1 percent. The natural vegetation is mainly salt tolerant shrubs, grasses, and forbs. Elevation is 2,850 to 2,900 feet.

Typically, the surface layer is very pale brown clay about 5 inches thick. The underlying material to a depth of 60 inches or more is pale brown and light yellowish

brown clay that includes soft lime masses and hard concretions below a depth of 40 inches. These lime masses and concretions form a discontinuous caliche layer that extends to a depth of 60 inches or more. The clay content increases as depth increases. Reaction is moderately alkaline or strongly alkaline. The upper 36 inches is strongly saline and strongly alkali. In some areas of similar included soils, the surface layer is silty clay loam to silty clay.

Included in this unit are small areas of Peterman clay on basin rims.

Permeability of this Bousic soil is slow. Available water capacity is very low or low because of the content of salts and alkali, but it is high in areas where the soil has been reclaimed. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat. Small areas have been reclaimed and are used for irrigated crops such as alfalfa, small grain hay, and pasture. This unit is also used for grazing.

This unit is poorly suited to irrigated crops unless it has been reclaimed. It is limited mainly by the high content of salts and alkali in areas that have not been reclaimed. In reclaimed areas, estimated yields for the crops grown are: alfalfa 5 to 7 tons, small grain hay 1.5 to 2.5 tons, and pasture 8 to 10 animal-unit-months.

The fine texture of the soil, slow permeability, and the problem of obtaining high quality water for leaching limit reclamation. The content of salts and alkali in the soil can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil. Generally, there is gypsum in this soil, which aids in the reclamation process. Subsoiling breaks up restrictive layers and allows water and salts to move out of the root zone. During reclamation, only highly salt tolerant plants should be grown. In areas where this soil has been irrigated for a long time, the content of salts in the upper 24 to 30 inches has been lowered to a satisfactory level for common salt tolerant plants. Grain can be seeded simultaneously with alfalfa or pasture plants to aid in establishing new seedlings. Returning crop residue to the soil reduces surface crusting and increases water infiltration.

Border and sprinkler irrigation systems are suited to this soil. Before reclamation has been completed, however, the use of sprinklers on this soil is limited by the slow water intake rate, fine surface texture, and muddiness. Muddiness hinders the movement of sprinkler equipment. Enough water must be applied to satisfy the needs of the crop and to leach the salts and alkali out of the root zone. In most areas the soil should be leveled and smoothed to obtain uniform distribution of water and to prevent salts from accumulating in high spots. Sprinkler systems should be designed so that the water is applied at a rate that does not exceed the water intake rate of the soil.

If this unit is used for grazing, the main limitation is the high content of salts and alkali. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial plant species. Major forage species are shadscale, fiddleneck, and filaree.

If this unit is used for homesite development, the main limitations are the hazard of flooding, high shrink-swell potential, slow permeability, and high content of salts and alkali.

Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. The effects of shrinking and swelling can be minimized by using an appropriate engineering design and by backfilling with material that has low shrink-swell potential. If this unit is used for septic tank absorption fields, longer absorption lines and the use of sandy backfill for the trench help to compensate for the slow permeability.

Landscaping plants that are salt and alkali tolerant should be used. Drainage, irrigation water management, and addition of soil amendments can reduce the content of salts and alkali.

This unit is suited to wetland wildlife developments such as fishponds or duckponds. It is limited by the high clay content, which makes the soil difficult to pack.

This map unit is in capability unit IVs-6 (30), irrigated, and capability subclass VIIs (30), nonirrigated.

105 Bryman loamy fine sand, 0 to 2 percent slopes. This very deep, well drained soil is on terraces and old alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are broad, smooth, slightly convex, and nearly level. Most areas are dissected by shallow intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 2,800 to 3,200 feet.

Typically, the surface layer is pale brown and light yellowish brown loamy fine sand about 9 inches thick. The upper part of the subsoil is brown sandy loam 3 inches thick over reddish brown sandy clay loam about 20 inches thick, the next part is pink sandy loam about 14 inches thick, and the lower part is light brown loamy sand about 34 inches thick. The substratum to a depth of 99 inches is light yellowish brown sand. Depth to the pink sandy loam is 30 to 63 inches. In some areas of similar included soils, the surface layer is loamy sand or coarse sand.

Included in this unit are small areas of Cajon sand on recent fans, Helendale loamy sand on old fans, Mohave Variant loamy sand on terraces near the Mojave River, and Bryman soils that have slopes of 3 to 4 percent.

Also included are small areas of soils that have pebbles and cobbles on the surface.

Permeability of this Bryman soil is moderately slow. Available water capacity is moderate or high. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly for irrigated crops. The main crops are alfalfa, small grain hay, and pasture. The unit is also used for grazing and homesite development and as wildlife habitat.

This unit is suited to irrigated crops. Estimated yields for the crops grown are: alfalfa 6 to 8 tons, small grain hay 1.5 to 2.5 tons, and pasture 10 to 12 animal-unit-months. This unit is limited by the hazard of soil blowing, the high water intake rate, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of the high water intake rate. Sprinkler systems, if properly designed, insure better distribution of water on soils that have a sandy surface layer. Border irrigation is also suited to this unit. In designing either type of irrigation system, the moderately slow permeability of the subsoil and the moderate or high available water capacity should be considered in determining the rate and frequency of application and the amount of the water to use. Irrigation water should be managed to meet the needs of the crop and to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. New alfalfa seedlings can be protected by fall seeding the alfalfa in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from wind damage.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for homesite development, it is limited by the moderate shrink-swell potential, low strength, the hazard of sloughing, the moderately slow permeability of the subsoil, the rapid permeability of the substratum, and the hazard of soil blowing. Buildings and roads should be designed to offset the effects of shrinking and swelling. If the unit is used as a base for roads, the upper part of the soil can be mixed with the underlying sand to increase its strength and stability. Cutbanks in the sandy part of the subsoil and of the substratum are subject to sloughing. Shoring should be considered to protect personnel working in trenches.

The limitation of moderately slow permeability in the subsoil can be overcome by increasing the size of the septic tank absorption field or by placing the filter tile below the restrictive layer. Because of the rapid permeability of the substratum, however, unfiltered effluent can contaminate the ground water.

As much existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used around homesites to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. In some areas historical clearing has contributed to an increase of Indian ricegrass. Major forage species are Indian ricegrass, desert needlegrass, and filaree.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

106 Bryman loamy fine sand, 2 to 5 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium derived dominantly from granitic material. Slopes are broad, smooth, convex, and gently sloping or undulating. Most areas are dissected by moderately deep intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 3,000 to 3,400 feet.

Typically, the surface layer is pale brown loamy fine sand about 9 inches thick. The upper part of the subsoil is reddish brown sandy clay loam about 34 inches thick, and the lower part to a depth of 60 inches or more is pink sandy loam. Depth to the sandy loam layer of the subsoil ranges from 30 to 63 inches. In some areas of similar included soils, the surface layer is loamy sand.

Included in this unit are small areas of Cajon sand on recent fans, Helendale loamy sand on old fans, and Mohave Variant loamy sand on terraces near the Mojave River. Also included are small areas of soils that have pebbles and cobbles on the surface.

Permeability of this Bryman soil is moderately slow. Available water capacity is moderate or high. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing. It is also used for irrigated crops such as alfalfa, small grain hay, and pasture. A few areas are used for homesite development.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many

perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. In some areas historical clearing has contributed to an increase of Indian ricegrass. Major forage species are Indian ricegrass, desert needlegrass, and filaree.

This unit is suited to irrigated crops. Estimated yields for the crops grown are: alfalfa 6 to 8 tons, small grain hay 1.5 to 2.5 tons, and pasture 10 to 12 animal-unit-months. This unit is limited by the hazard of soil blowing, high water intake rate, slope, and low fertility. Sprinkler irrigation is better suited to this unit than most other irrigation methods because of the high water intake rate and slope. Sprinkler systems, if properly designed, insure better distribution of water on soils that have a sandy surface layer. In designing the irrigation system, the moderately slow permeability of the subsoil and the moderate or high available water capacity should be considered in determining the rate and frequency of application and the amount of water to use. Irrigation water should also be managed to meet the needs of the crop and to conserve water and keep soil losses to a minimum.

This unit should not be leveled for irrigation. Leveling will expose sandy clay loam, and the resulting surface layer of the soil will be sandy clay loam and loamy fine sand. In this material, the water intake rate will vary from low to high and proper distribution of irrigation water will be difficult to achieve.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. New alfalfa seedlings can be protected by fall seeding the alfalfa in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from wind damage.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for homesite development, it is limited by the moderate shrink-swell potential, low strength, hazard of sloughing, the moderately slow permeability of the subsoil, the rapid permeability of the substratum, and the hazard of soil blowing. Buildings and roads should be designed to offset the effects of shrinking and swelling. If the unit is used as a base for roads, the upper part of the soil can be mixed with the underlying loamy sand to increase its strength and stability. Cutbanks in the sandy part of the subsoil and in the substratum are subject to sloughing. Shoring can be used to prevent trenches from caving in.

The limitation of moderately slow permeability in the subsoil can be overcome by increasing the size of the septic tank absorption field or by placing the filter tile below the restrictive layer. Because of the rapid permeability of the substratum, however, unfiltered effluent can contaminate the ground water.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used around homesites to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

107 Bryman loamy fine sand, 5 to 9 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium derived dominantly from granitic material. Slopes are short, convex, and moderately sloping. Most areas are dissected by deep intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 3,000 to 3,200 feet.

Typically, the surface layer is light yellowish brown loamy fine sand about 9 inches thick. The upper part of the subsoil is reddish brown sandy clay loam about 30 inches thick, and the lower part of the subsoil and the substratum are light brown and light yellowish brown loamy sand to a depth of 60 inches or more. Depth to loamy sand is 30 to 63 inches. In some areas of similar included soils, the surface layer is sand or loamy sand.

Included in this unit are small areas of Cajon sand on recent fans, Helendale loamy sand on old fans, and Bryman soils that have slopes of 10 to 13 percent. Also included are small areas of soils that have pebbles and cobbles on the surface.

Permeability of this Bryman soil is moderately slow. Available water capacity is moderate or high. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. In some areas historical clearing has contributed to an increase of Indian ricegrass. Major forage species are Indian ricegrass, desert needlegrass, and filaree.

If this unit is used for homesite development, it is limited by the moderate shrink-swell potential, low strength, hazard of sloughing, the moderately slow permeability of the subsoil, the rapid permeability of the

substratum if septic tanks are used, and the hazard of soil blowing. Buildings and roads should be designed to offset the effects of shrinking and swelling. If the unit is used as a base for roads, the upper part of the soil can be mixed with the underlying sand to increase its strength and stability. Cutbanks in the sandy part of the subsoil and in the substratum are subject to sloughing. Shoring can be used to prevent trenches from caving in.

The moderately slow permeability of the subsoil can be overcome by increasing the size of the septic tank absorption field or by placing the filter tile below the restrictive layer. Because of the rapid permeability of the substratum, however, unfiltered effluent can contaminate the ground water.

As much of the existing natural vegetation as feasible should be left around homesites to reduce the hazard of water erosion and soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used around homesites to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability subclass VIIe (30), nonirrigated.

108 Bryman loamy fine sand, 9 to 15 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium derived dominantly from granitic material. Slopes are short, convex, and strongly sloping. Most areas are dissected by deep intermittent drainageways or small eroding gullies. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 3,000 to 3,200 feet.

Typically, the surface layer is very pale brown loamy fine sand about 9 inches thick. The subsoil is reddish brown sandy clay loam about 30 inches thick. The substratum is light yellowish brown loamy sand to a depth of 60 inches or more. Depth to the loamy sand is 30 to 63 inches. In some areas of similar included soils, the surface layer is sand.

Included in this unit are small areas of Cajon sand on recent fans, Helendale loamy sand on old fans, and Lavic loamy fine sand on fans and remnant surfaces. Also included are small areas of soils that are similar to this Bryman soil but have slopes of more than 15 percent and soils that have pebbles and cobbles on the surface.

Permeability of this Bryman soil is moderately slow. Available water capacity is moderate or high. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the hazards of water erosion and soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased water erosion, soil blowing, barren areas, and lower overall production. Major forage species are Indian ricegrass, desert needlegrass, and filaree.

If this unit is used for homesite development, the main limitations are the shrink-swell potential, low strength, hazard of sloughing, the moderately slow permeability of the subsoil, the hazard of contaminating the ground water if septic tanks are used, slope, and the hazards of water erosion and soil blowing. Buildings and roads should be designed to offset the effects of shrinking and swelling. If the unit is used as a base for roads, the upper part of the soil can be mixed with the underlying loamy sand to increase its strength and stability. Cutbanks in the sandy material of the lower part of the subsoil and substratum are subject to sloughing. Shoring can be used to prevent trenches from caving in.

The limitation of moderately slow permeability in the subsoil can be overcome by increasing the size of the septic tank absorption field or by placing the filter tile below the restrictive layer. Because of the rapid permeability of the substratum, however, unfiltered effluent can contaminate the ground water. Steepness of slope is also a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

As much of the existing natural vegetation as feasible should be left around homesites to reduce water erosion and soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used around homesites to provide protection from the wind and reduce soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability subclass VIIe (30), nonirrigated.

109 Bryman sandy clay loam, 0 to 2 percent slopes. This very deep, well drained soil is on alluvial fans adjacent to closed basins. It formed in alluvium derived dominantly from granitic material. Slopes are long and narrow. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 2,850 to 2,900 feet.

Typically, the surface layer is pink or pinkish gray sandy clay loam about 6 inches thick. The subsoil is reddish brown sandy clay loam about 38 inches thick. The substratum is light yellowish brown loamy sand and sand to a depth of 60 inches. Depth to loamy sand is 30 to 63 inches. In some areas of similar included soils, the surface layer is sandy loam.

Included in this unit are small areas of Helendale loamy sand on old fans, Peterman clay on basin rims, and Bryman soils that have slopes of 2 to 3 percent. Also included are small areas of soils that are similar to this Bryman soil but have a fine sandy loam substratum.

Permeability of this Bryman soil is moderately slow. Available water capacity is high. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the main limitations are low precipitation and the clayey texture of the surface layer. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in barren areas and lower overall production. Grazing when the soil is wet compacts the soil and reduces forage production. Major forage species are saltbush, fiddleneck, and filaree.

If this unit is used for homesite development, the main limitations are the hazard of flooding, shrink-swell potential, low strength, hazard of sloughing, the moderately slow permeability of the subsoil, and the hazard of contaminating the ground water if septic tanks are used. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding.

Buildings and roads should be designed to offset the effects of shrinking and swelling. If used as a base for roads, the upper part of the soil can be mixed with the underlying loamy sand and sand to increase its strength and stability. Cutbanks in the sandy material of the lower part of the subsoil and in the substratum are subject to sloughing. Shoring can be used to prevent trenches from caving in.

The moderately slow permeability of the subsoil can be overcome by increasing the size of the septic tank absorption field or by placing the filter tile below the restrictive layer; however, because of the rapid permeability of the substratum, unfiltered effluent can contaminate the ground water.

As much existing natural vegetation as feasible should be left around homesites. Windbreaks can be used around homesites to provide protection from the wind. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability subclass VIIe (30), nonirrigated.

110 Bryman-Cajon association, rolling. This map unit is on terraces and alluvial fans. Some areas are dissected by numerous, very deep, intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 3,500 to 4,000 feet.

This unit is 55 percent Bryman stony sand and 30 percent Cajon gravelly sand. The Bryman soil is on terraces. Slopes are rolling and range from 9 to 15 percent. The Cajon soil is on narrow alluvial fans between the terraces. Slopes are mainly concave and range from 0 to 5 percent.

Included in this unit are small areas of Wasco soils near drainageways, Arrastre soils and Rock outcrop in areas adjacent to the steeper uplands, and soils on Juniper Flats that are redder in the upper part of the subsoil and have a subsoil that is higher in clay content and is 36 to 40 inches thick. Also included are some areas where the substratum is strongly alkaline. Areas that are dissected by deep drainageways have slopes of 15 percent to 50 percent. Included areas make up about 15 percent of the total acreage.

The Bryman soil is very deep and well drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is light yellowish brown stony sand about 6 inches thick. The upper 25 inches of the subsoil is reddish yellow gravelly sandy clay loam, and the lower 20 inches is reddish yellow gravelly sandy loam. The substratum to a depth of 60 inches or more is light yellowish brown and very pale brown gravelly coarse sand. Depth to gravelly sandy loam is 30 to 63 inches. In some areas of similar included soils, the surface layer is stony loamy sand.

Permeability of the Bryman soil is moderately slow. Available water capacity is low or moderate. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more.

The Cajon soil is very deep and somewhat excessively drained. It formed in alluvium derived dominantly from granitic rock. Typically, the surface layer is very pale brown gravelly sand about 6 inches thick. The underlying material to a depth of 60 inches or more is also very pale brown gravelly sand.

Permeability of the Cajon soil is rapid. Available water capacity is very low and low. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is slight when the surface is not protected. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing. A few small areas of the Bryman soil are used for homesite development.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in barren areas and lower overall

production. Plants having low forage importance but having wildlife habitat and esthetic significance are juniper and Joshua-tree. Major forage species are desert needlegrass, winterfat, and red brome.

If this unit is used for homesite development, the main limitations of the Bryman soil are shrink-swell potential, low strength, hazard of sloughing, moderately slow permeability of the subsoil, the hazard of contaminating the ground water when septic tanks are used, slope, and the stony surface layer. Buildings and roads should be designed to offset the effects of shrinking and swelling. If used as a base for roads, the upper part of the soil can be mixed with the underlying gravelly coarse sand to increase its strength and stability. Cutbanks in the sandy material of the lower part of the subsoil and substratum are subject to sloughing. Shoring can be used to prevent trenches from caving in.

The moderately slow permeability of the subsoil can be overcome by increasing the size of the septic tank absorption field or by placing the filter tile below the restrictive layer. However, because of the rapid permeability of the substratum, unfiltered effluent can contaminate the ground water. Steepness of slope is also a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

The main limitations of the Cajon soil are the rapid permeability and the hazard of sloughing. Because of the rapid permeability, septic tank absorption fields function well except that unfiltered effluent can contaminate the ground water. Because of the sandy texture of the soil, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much existing natural vegetation as feasible should be left around homesites on this unit. Windbreaks can be used around homesites to provide protection from the wind. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating. The stony surface layer of the Bryman soil is a limitation in landscaping.

This map unit is in capability subclass VIIe (30), nonirrigated.

111 Bull Trail-Typic Xerorthents association, moderately steep. This map unit is on old alluvial fans and uplands. The natural vegetation is mainly juniper, desert shrubs, grasses, and forbs. Elevation is 4,200 to 5,000 feet.

This unit is 65 percent Bull Trail sandy loam and 25 percent Typic Xerorthents. The Bull Trail soil is on the higher parts of old fans and on terraces just below the hogbacks and cuestas. Slopes mainly face northeast, are moderately steep, and range from 15 to 30 percent. Typic Xerorthents are on hogbacks and cuestas and on the back slopes, or inface bluffs, of these landforms. Slopes mainly face southwest, are steep to very steep, and range from 40 to 60 percent.

Included in this unit are small areas of Wrightwood loamy sand on terrace remnants; Gullied land on highly dissected old fans and foothills; Haploxeralfs on narrow ridges between gullies, on truncated ridges of actively eroding back slopes and scarp faces, and on gently sloping to steep side slopes or toe slopes of old fans and terraces; Avawatz sandy loam in intermittent stream channels; and Badland on scarp faces adjacent to Typic Xerorthents. Also included are small areas of soils that are similar to the Bull Trail soils but have a gravelly sandy clay loam subsoil and a gravelly sandy loam or gravelly loamy sand substratum that is 5 percent cobbles and soils that have slopes of 30 to 40 percent and are on side slopes and narrow ridgetops. Included areas make up about 10 percent of the total acreage.

The Bull Trail soil is very deep and well drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is brown sandy loam about 4 inches thick. The upper 15 inches of the subsoil is yellowish red sandy clay loam, and the lower part to a depth of 60 inches or more is reddish yellow sandy loam. In some areas of similar included soils, the surface layer is fine sandy loam.

Permeability of the Bull Trail soil is moderately slow. Available water capacity is moderate or high. Runoff is medium, and the hazard of water erosion is moderate or high. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more.

The Typic Xerorthents are very deep and somewhat excessively drained to well drained. They formed in stratified nonmarine alluvium derived dominantly from granitic material. Back slopes of cuestas and hogbacks reveal the monoclinal stratified sediment that is the parent material of the Typic Xerorthents. Downcutting by geologic erosion and mass wasting shows the wide variation in texture and color of the different layers of sediment. Textures range from very gravelly sand to sandy clay loam. Colors are also highly varied. Actively eroding gullies are evident on the back slopes of cuestas and hogbacks. The rugged relief, the variation in the stratified alluvium, and the shaping and sculpting caused by erosion make specific characterization and classification of the Typic Xerorthents impossible.

Permeability of the Typic Xerorthents is very rapid to moderately slow. Runoff is rapid, and hazard of water erosion is moderate or high. The hazard of soil blowing is slight or moderate. Effective rooting depth is 60 inches or more.

This unit is used mainly for wildlife habitat. The Bull Trail soils are also used for grazing.

If the Bull Trail soil is used for grazing, the main limitation is the hazard of water erosion. Grazing is limited to a few weeks in spring when plant growth is at its peak. Prescribed burning or thinning increases the production of forage by reducing the competition from

California juniper. Brush management that includes properly designed firebreaks, livestock trails, and access roads is necessary to limit wildfires and soil erosion. Natural terrain barriers associated with this unit should be used as livestock management area boundaries. Major forage species for wildlife and livestock are bluegrass, desert needlegrass, and brome.

The Bull Trail soil is in capability subclass VIIe (20), nonirrigated. Typic Xerorthents are in capability subclass VIIIe (20), nonirrigated.

112 Cajon sand, 0 to 2 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are broad, long, smooth, and nearly level. Most areas are dissected by long, shallow intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 1,800 to 3,200 feet.

Typically, the surface layer and upper part of the underlying material are very pale brown sand about 7 inches thick. The next 18 inches of the underlying material is very pale brown sand, the next 20 inches is very pale brown gravelly sand, and the lower part to a depth of 60 inches or more is very pale brown sand. In some areas of similar included soils, the surface layer is loamy sand.

Included in this unit are small areas of Helendale loamy sand on old fans, Kimberlina loamy fine sand, and Manet coarse sand on recent fans.

Permeability of this Cajon soil is rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly for irrigated crops and homesite development. The main crops are alfalfa, small grain hay, and pasture. It is also used for grazing and wildlife habitat.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 5 to 7 tons, small grain hay 1.5 to 2.5 tons, and pasture 7 to 9 animal-unit-months. The unit is limited by the hazard of soil blowing, high water intake rate, low available water capacity, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of the high water intake rate and low available water capacity. Sprinkler systems, if properly designed, insure better distribution of water. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing. Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for homesite development, the main limitations are the rapid permeability if septic tanks are used, the low available water capacity, the hazard of sloughing, and the hazard of soil blowing. Because of the rapid permeability, septic tank absorption fields function well; however, unfiltered effluent can contaminate the ground water. Because of the sandy texture of the soil, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to provide protection from the wind and reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by fertilizing, mulching, and irrigation.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak and should be managed to protect the unit from excessive water erosion. Major forage species are Indian ricegrass, saltbush, and filaree.

This map unit is in capability unit IIIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

113 Cajon sand, 2 to 9 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are long, smooth, and gently sloping to moderately sloping. Most areas are dissected by long, shallow, intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 1,800 to 3,500 feet.

Typically, the surface layer is very pale brown sand about 6 inches thick. The upper 19 inches of the underlying material is very pale brown sand, and the lower part to a depth of 60 inches or more is very pale brown gravelly sand that has a strata of sand.

Included in this unit are small areas of Helendale loamy sand on old fans and Kimberlina loamy fine sand on recent fans. Also included are small areas of soils that have pebbles on the surface.

Permeability of this Cajon soil is rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly for wildlife habitat and homesite development. It is also used for irrigated crops, mainly alfalfa, pasture and small grain hay, and for grazing.

If this unit is used for homesite development, the main limitations are the rapid permeability if septic tanks are used, the hazard of sloughing, the low available water capacity, the hazard of soil blowing, and the hazard of water erosion. Because of the rapid permeability, septic tank absorption fields function well; however, unfiltered effluent can contaminate the ground water. Because of the sandy texture of the soil, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce water erosion and soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 5 to 7 tons, small grain hay 1. 5 to 2.5 tons, and pasture 7 to 9 animal-unit-months. The unit is limited by the hazard of soil blowing, the high water intake rate, the low available water capacity, the hazard of water erosion, slope, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of the high water intake rate, low available water capacity, and slope. Sprinkler systems, if properly designed, insure better distribution of water on sandy, sloping soils. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop. This helps to conserve water and keep soil losses to a minimum.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and water erosion and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing. Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Major forage species are Indian rice grass, saltbush, and filaree.

This map unit is in capability unit IIIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

114 Cajon sand, 9 to 15 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are short, convex, and strongly sloping. Most areas are dissected by shallow intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 1,800 to 4,000 feet.

Typically, the surface layer is very pale brown sand 6 inches thick. The upper 36 inches of the underlying material is light yellowish brown sand, and the lower part to a depth of 60 inches or more is light yellowish brown gravelly sand and strata of sand.

Included in this unit are small areas of Arizo gravelly loamy sand and Cajon gravelly sand on recent fans. Also included are small areas of soils that are similar to this Cajon soil but have slopes of more than 15 percent and small areas of soils that have pebbles on the surface.

Permeability of this Cajon soil is rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the hazards of water erosion and soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion and soil blowing. Major forage species are Indian ricegrass, saltbush, and filaree.

This map unit is in capability subclass VIIe (30), nonirrigated.

115 Cajon gravelly sand, 2 to 15 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are long, smooth, convex, and gently sloping to strongly sloping. Most areas are dissected by deep intermittent drainageways. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,300 to 3,500 feet.

Typically, the surface layer is very pale brown gravelly sand about 8 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown gravelly sand. In some areas of similar included soils, the surface layer is gravelly loamy coarse sand.

Included in this unit are small areas of Arizo gravelly loamy sand and Cajon sand on recent fans and Kimberlina and Yermo soils on alluvial fans and hills. Also included are small areas of soils that have cobbles and stones on the surface.

Permeability of this Cajon soil is rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be

managed to protect the unit from excessive water erosion and soil blowing. In some areas cobbles, stones, and large pebbles on the surface limit animal and vehicular traffic. Natural terrain barriers associated with this soil should be used as livestock management area boundaries. Major forage species are phacelia, brome, and filaree.

If this unit is used for homesite development, the main limitations are the hazard of flooding, the rapid permeability if septic tanks are used, the low available water capacity, the hazard of sloughing and slope. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Because of the rapid permeability, septic tank absorption fields function well; however, unfiltered effluent can contaminate the ground water. Steepness of slope is also a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Because of the sandy texture of the soil, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind. Among the trees suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability subclass VIIe (30), nonirrigated.

116 Cajon loamy sand, 5 to 9 percent slopes. This very deep, somewhat excessively drained soil is on dissected old alluvial fans that have some remnant surfaces. It formed in nonmarine alluvium derived dominantly from granitic material. Geologic erosion is evident over most of the unit. Moderate sheet and rill erosion affects about 40 percent of the area, mainly along ridgetops. Most areas are dissected by deep intermittent drainageways. There are some shallow gullies on side slopes. Slopes are dominantly short, convex, and moderately sloping to gently rolling. Natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 2,550 to 2,800 feet.

Typically, the surface layer is very pale brown loamy sand about 6 inches thick. The upper 24 inches of the underlying material is very pale brown loamy sand, and the lower part to a depth of 60 inches or more is very pale brown gravelly sand. In some areas of similar included soils, the surface layer is loamy fine sand.

Included in this unit are small areas of Cajon sand on recent fans and Helendale loamy sand on old stable fans. Also included are small areas of soils that have pebbles and cobbles on the surface.

Permeability of this Cajon soil is rapid. Available water capacity is low or moderate. Runoff is rapid, and the hazard of water erosion is moderate or high. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the hazards of water erosion and soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Major forage species are Indian ricegrass, saltbush, and filaree.

This map unit is in capability subclass VIIe (30), nonirrigated.

117 Cajon loamy sand, loamy substratum, 0 to 2 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans and river terraces. It formed in alluvium derived dominantly from granitic material. Slopes are long, smooth, and nearly level. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 1,800 to 2,300 feet.

Typically, the surface layer is very pale brown loamy sand about 7 inches thick. The upper 35 inches of the underlying material is very pale brown sand and loamy sand, and the lower part to a depth of 60 inches or more is very pale brown sand and strata of sandy loam to clay loam. These strata vary in thickness from about 3/8 inch to 2 1/2 inches. The lower part of the underlying material is nonsaline to slightly saline. In the Hinkley area, the strata are 1 inch to 4 inches thick. In some areas of similar included soils, the surface layer is sand.

Included in this unit are small areas of Halloran sandy loam on river terraces, Cajon sand on recent fans, and Cajon soils that have slopes of 3 to 5 percent. Also included are small areas of soils on river terraces and strata of sandy loam to clay loam between depths of 20 and 40 inches.

Permeability of this Cajon soil is rapid to a depth of 40 inches and is moderate below this depth. Available water capacity is low or moderate. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used for small fishponds and wildlife habitat. It is also used for irrigated crops, mainly alfalfa, pasture, and small grain hay (fig. 6). A few areas are used for homesite development and for grazing.

This unit is suited to development of wetland wildlife habitat such as fishponds or duckponds because of the moderately permeable substratum.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 6 to 8 tons, small grain hay 1.5 to 2.5 tons, and pasture 8 to 10 animal-unit-months. The unit is limited by the hazard of

Figure 6. Irrigated barley hay in an area of Cajon loamy sand, loamy substratum, 0 to 2 percent slopes. Sparkhule Mountain is in the background.

soil blowing, high water intake rate, low or moderate available water capacity, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of the high water intake rate and low or moderate available water capacity. Sprinkler systems, if properly designed, insure better distribution of water on soils that have a loamy sand surface layer. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for homesite development, the main limitations are the hazard of sloughing, the low or moderate available water capacity, and the hazard of soil blowing. Because of the sandy texture of the substratum, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive soil blowing. Major forage species are Indian ricegrass and saltbush.

This map unit is in capability unit IIIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

118 Cajon-Arizo complex, 2 to 15 percent slopes. This map unit is on alluvial fans. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,800 to 3,300 feet.

This unit is 55 percent Cajon gravelly sand and 30 percent Arizo gravelly loamy sand. The Cajon soil is on wide margins of alluvial fans, on side slopes of coalescing fans, and in interfan drainageways. Slopes are broad, convex, and gently sloping to rolling. The Arizo soil is in upper positions of alluvial fans near mountains or foothills. Slopes are long, narrow to broad, and gently sloping to moderately sloping and range from 2 to 9 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Helendale loamy sand, Bryman loamy fine sand, and Joshua loam on terrace remnants. Also included are small areas on the upper part of alluvial fans that have layers of sandy clay loam at a depth of more than 36 inches. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Cajon soil is very deep and somewhat excessively drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is very pale brown gravelly sand about 6 inches thick. The underlying material to a depth of 60 inches or more is very pale brown gravelly sand that has strata of sand. In some areas of similar included soils, the surface layer is sand.

Permeability of the Cajon soil is rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

The Arizo soil is very deep and excessively drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is pale brown gravelly loamy sand about 6 inches thick. The underlying material to a depth of 60 inches or more is pale brown very gravelly loamy sand.

Permeability of the Arizo soil is very rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more. The soil is subject to occasional, very brief periods of flooding.

This unit is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Major forage species are desert needlegrass, brome, and filaree.

If this unit is used for homesite development, the main limitations are the hazard of flooding, the low available water capacity, and the rapid permeability if septic tanks are used. In addition, the Cajon soil is limited by the hazard of sloughing and the Arizo soil is limited by the content of pebbles, cobbles, and stones. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Septic tank absorption fields function well; however, because of the rapid and very rapid permeability, unfiltered effluent can contaminate the ground water. Because of the sandy texture of the soil, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites. Windbreaks can be used to provide protection from the wind. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel. Establishment of landscaping plants is limited by the pebbles, cobbles, and stones in this unit and the low available water capacity.

This map unit is in capability subclass VIIe (30), nonirrigated.

119 Cajon-Wasco, cool, complex, 2 to 9 percent slopes. This map unit is on alluvial fans. Most areas are dissected by moderately deep intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 2,300 to 3,200 feet.

This unit is 65 percent Cajon sand and 30 percent Wasco sandy loam. Cajon and Wasco soils are on long and narrow alluvial fans. Slopes of the Cajon soil are convex and gently sloping or moderately sloping and range from 2 to 9 percent. Slopes of the Wasco soil are convex and gently sloping and range from 2 to 5 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of soils that have stones and boulders on the surface and are adjacent to intermittent drainageways. Also included are small areas of Cajon sand that has slopes of 9 to 15 percent, soils that are similar to the Wasco soil but are gravelly throughout, and Riverwash. Included areas make up about 5 percent of the total acreage.

The Cajon soil is very deep and somewhat excessively drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is light yellowish brown sand about 8 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown sand.

Permeability of the Cajon soil is rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

The Wasco soil is very deep and well drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is light yellowish

brown sandy loam about 7 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown sandy loam. It is noncalcareous and has a neutral reaction in the upper 40 inches. Reaction is mildly alkaline below a depth of 40 inches. In some areas of similar included soils, the surface layer is loamy sand.

Permeability of the Wasco soil is moderately rapid. Available water capacity is low or moderate. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion and soil blowing. Major forage species are Indian ricegrass, red brome, and saltbush.

This map unit is in capability subclass VIIe (30), nonirrigated.

120 Cave loam, dry, 0 to 2 percent slopes. This shallow, well drained soil is on the lower margins of alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are broad, smooth, and nearly level. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,200 to 2,950 feet.

Typically, the surface layer is very pale brown loam about 6 inches thick. The underlying material to a depth of 14 inches is very pale brown loam, and the next layer is a white, strongly cemented caliche hardpan about 7 inches thick. The substratum to a depth of 60 inches or more is light gray loam and pale brown sand. Depth to the caliche hardpan ranges from 14 to 20 inches. In some areas of similar included soils, the surface layer is sandy loam.

Included in this unit are small areas of Lavic loamy fine sand on fans and basin rims and Kimberlina loamy fine sand on fans. Also included are small areas of soils that have a sandy loam or sandy clay loam subsoil directly above the caliche hardpan.

Permeability of this Cave soil is moderate above the hardpan and very slow in the hardpan. Available water capacity is very low and low. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Effective rooting depth is 14 to 20 inches.

This unit is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the main limitations are low precipitation, the very low and low available water capacity, and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Major forage species are Indian ricegrass and fourwing saltbush.

If this unit is used for homesite development, it is limited for most uses by the depth to the hardpan and by the hazard of soil blowing. Excavation for roads, building sites, and septic tank absorption fields is limited by the thick caliche layer. Onsite sewage disposal systems often fail or do not function properly because of the restrictive layer.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and to reduce soil blowing. Shattering the caliche layer by ripping, blasting, or other methods increases water penetration and rooting depth in some areas. Among the trees most suitable for planting are Arizona cypress and Athel. The shallow effective rooting depth should be considered in selecting landscaping plants and in planning the timing, rate, and amount of irrigation.

This map unit is in capability subclass VIIs (30), nonirrigated.

121 Crafton-Sheephead-Rock outcrop association, steep. This map unit is on mountains and foothills. Natural vegetation is mainly singleleaf pinyon, shrubs, grasses, and forbs (fig. 7). Elevation is 3,400 to 6,200 feet.

This unit is 35 percent Crafton sandy loam, 30 percent Sheephead gravelly sandy loam, and 15 percent Rock outcrop. The Crafton soil is dominantly on north aspects of rugged hillsides and mountainsides. Slopes are steep and range from 30 to 50 percent. The Sheephead soil is on ridgetops, knolls, and side slopes and on the south aspect of mountainsides. Slopes are moderately steep or hilly and range from 15 to 30 percent. Rock outcrop is on ridgetops.

Included in this unit are small areas of Cushenbury loamy sand on hillsides and Arrastre sandy loam on hillsides and mountainsides. Also included are small areas of soils that are similar to the Sheephead soil but have a strong brown or yellowish red substratum and soils that have hard granitic rock at a depth of 16 to 18 inches. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Crafton soil is moderately deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown sandy loam about 10 inches thick. The underlying material to a depth of 35 inches is pale brown sandy loam and light yellowish brown gravelly sandy loam over shattered, somewhat weathered granitic rock. Depth to weathered rock ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is gravelly sandy loam.

Figure 7. Singleleaf pinyon, shrubs, grasses, and forbs in an area of Crafton-Sheephead-Rock outcrop association, steep.

Permeability of the Crafton soil is moderately rapid. Available water capacity is very low or low. Runoff is medium or rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. Effective rooting depth is 20 to 40 inches.

The Sheephead soil is shallow and somewhat excessively drained. It formed in material weathered from granitic rock. Typically, the surface layer is grayish brown gravelly sandy loam about 14 inches thick. The underlying material to a depth of 18 inches is brown gravelly sandy loam over weathered granitic rock. Depth to weathered rock ranges from 15 to 20 inches.

Permeability of the Sheephead soil is moderately rapid. Available water capacity is very low or low. Runoff is medium or rapid, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is slight. Effective rooting depth is 15 to 20 inches.

Rock outcrop consists of exposed areas of granitic rock.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are the very low or low available water capacity and the hazard of water erosion. Grazing is limited to a few weeks in spring when plant growth is at its peak. Prescribed burning or thinning increases the production of forage by reducing the competition from singleleaf pinyon. Brush management that includes properly designed fire breaks, livestock trails, and access roads is necessary to limit wildfires and soil erosion. Natural terrain barriers associated with this unit should be used as livestock management area boundaries. Major forage species are desert needlegrass, brome, and desert bitterbrush.

The Sheephead soil is suited to the production of singleleaf pinyon. It can produce 8.5 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. Because of the soil depth and very low

or low available water capacity, seeding mortality is a major limitation. Management that minimizes erosion is essential in areas where firewood is harvested. Access roads should be located to prevent gullying and sedimentation of streams.

Moderate grazing use can complement woodland production on the Sheephead soil if grazing is restricted to late in spring or early in summer to prevent excessive browsing and soil compaction. Key understory forage species are desert bitterbrush, bluegrass, and filaree. The soil can produce about 1,600 pounds of air-dry vegetation per acre in a favorable year, 1,000 pounds in a normal year, and 500 pounds in an unfavorable year.

The Crafton and Sheephead soils are in capability subclass VIIe (20), nonirrigated.

122 Cushenbury-Crafton-Rock outcrop complex, 15 to 50 percent slopes. This map unit is on foothills and mountains. The natural vegetation is mainly juniper, desert shrubs, grasses, and forbs. Elevation is 4,500 to 5,500 feet.

This unit is 35 percent Cushenbury loamy sand, 25 percent Crafton sandy loam, and 20 percent Rock outcrop. The Cushenbury soil is on hillsides, knolls, and ridgetops. Slopes are moderately steep or hilly and range from 15 to 30 percent. The Crafton soil is dominantly on north aspects of rugged hillsides and mountainsides. Slopes are moderately steep and steep and range from 15 to 50 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Sheephead gravelly sandy loam on hillsides and ridgetops and Arrastre sandy loam on mountainsides and ridges. Also included are small areas of soils that are similar to the Sheephead soil but have hard granitic rock at a depth of 14 to 16 inches and are in the vicinity of Bowen Ranch and soils that are similar to the Cushenbury soil but are on strongly sloping toe slopes and have a thin, strong brown sandy clay loam subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Cushenbury soil is moderately deep and well drained. It formed in material weathered from granitic rock. Typically, the upper part of the surface layer is brown loamy sand about 14 inches thick and the lower part is brown sandy loam about 13 inches thick. The subsoil to a depth of 39 inches is yellowish brown gravelly sandy loam over weathered granitic rock. In some areas of similar included soils, the surface layer is gravelly sandy loam or loamy sand. Depth to weathered rock ranges from 20 to 40 inches.

Permeability of the Cushenbury soil is moderately rapid. Available water capacity is very low or low. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. Effective rooting depth is 20 to 40 inches.

The Crafton soil is moderately deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown sandy loam about 10 inches thick. The underlying material to a depth of 35 inches is pale brown sandy loam and light yellowish brown gravelly sandy loam over shattered, weathered granitic rock. Depth to weathered rock ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is gravelly sandy loam or loamy sand.

Permeability of the Crafton soil is moderately rapid. Available water capacity is very low or low. Runoff is medium or rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. Effective rooting depth is 20 to 40 inches.

Rock outcrop consists of exposed areas of granitic rock.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are the very low or low available water capacity and the hazards of water erosion and soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Prescribed burning or thinning increases the production of forage by reducing the competition from California juniper. Brush management that includes properly designed firebreaks, livestock trails, and access roads is necessary to limit wildfires, soil blowing, and water erosion. Major forage species are desert needlegrass, brome, and desert bitterbrush.

The Cushenbury and Crafton soils are in capability subclass VIIe (20), nonirrigated.

123 Dune land. This map unit consists of unstable hills and ridges of loose, wind-deposited sand. It is excessively drained and is barren.

Typically, Dune land is sand that is blown and shifted by the wind. Dunes vary in size and shape. Generally, they are less than 15 feet high, but some are 25 feet high. Slopes are 5 to 15 percent.

Included in this unit are small areas of Cajon sand between dunes, Riverwash and Villa loamy sand along the Mojave River, and Halloran soils in blowout areas between dunes. In some areas mesquite is associated with the dunes. Also included are small areas of silty clay loam aggregates piled into dunes on the west side of Lucerne Dry Lake.

Permeability is very rapid. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high.

This unit is used for recreation and wildlife habitat.

This map unit is in capability subclass VIIIe (30), nonirrigated.

124 Fluvents, occasionally flooded. These very deep, poorly drained to moderately well drained soils are on narrow flood plains along the Mojave River, in the vicinity of Fort Cady. They formed in alluvium derived

dominantly from granitic material. Slope is 0 to 2 percent. The natural vegetation is mainly riparian trees, desert shrubs, grasses, and forbs. Elevation is 1,700 to 1,760 feet.

Fluvents are highly stratified. Depth to the water table, soil texture, and other soil properties are highly variable. The stratification is caused by occasional flooding, which removes, sorts, and redistributes the alluvial material. Because depth to the bedrock underlying the river sediment is shallow, drainage is restricted and the flow of ground water is directed toward the surface. The soil is dominantly coarse sand, sand, or fine sand that has thin to thick strata of fine sandy loam, sandy loam, loam, or clay loam and interlayered bands of decomposed and undecomposed organic matter. In most areas there are prominent mottles between the surface and a depth of 40 inches. In some areas the surface has a thin, patchy salt crust.

Included in this unit are small areas of Villa loamy sand and Victorville sandy loam on low river terraces and flood plains. Also included are small areas of Riverwash.

Permeability of the Fluvents is rapid to moderately slow. Runoff is slow or very slow. Deposition and channeling are common. Soil blowing is moderate or high. The water table ranges from the surface to a depth of 6 feet or more, but it is generally above a depth of 5 feet. Generally, the water table is highest in winter and early in spring and during brief periods after high intensity rains and flooding in summer. The soil is subject to occasional flooding.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are low precipitation, the hazard of flooding, and the hazard of soil blowing. Livestock grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive soil blowing. The construction of dams and excavated ponds for livestock and wildlife is limited by the hazard of flooding. Floods that inundate this unit can destroy the ponds. Major forage species are saltbush and willow.

This map unit is in capability subclass VIw (30), nonirrigated.

125 Glendale Variant silt loam, saline-alkali. This very deep, moderately well drained soil is on basin rims and lower margins of narrow alluvial fans. It formed in alluvium derived from mixed sources. Slopes are long and nearly level and range from 0 to 2 percent. The natural vegetation is mainly salt tolerant shrubs, grasses, and forbs. Elevation is 2,850 to 2,950 feet.

Typically, the surface layer is very pale brown silt loam about 11 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown and pale brown silty clay loam. The surface layer and underlying material are moderately alkaline or strongly alkaline. They are moderately saline or strongly saline and strongly alkali to a depth of about 30 inches. In some areas strata of loam and clay loam are below a depth of 40 inches. Also, in some areas of similar included soils, the surface layer is loam or silty clay loam.

Included in this unit are small areas of Lavic loamy fine sand on fans and basin rims. Also included are small areas where hummocks of loamy fine sand are at the base of shrubs.

Permeability of this Glendale Variant soil is moderately slow. If the soil has been reclaimed, available water capacity is high. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat and for grazing. Areas that have been reclaimed are also used for irrigated crops, mainly alfalfa and pasture. A few areas are used for homesite development.

If this unit is used for grazing, the main limitations are low precipitation and the moderate or high content of salts and alkali. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in barren areas and lower overall production. Major forage species are saltbush, filaree, and brome.

This unit is suited to irrigated crops in areas where it has been reclaimed. In areas that have not been reclaimed, it is limited by the moderate to high content of salts and alkali, moderately slow permeability, the hazard of soil blowing, and low fertility. In reclaimed areas, estimated yields of the crops grown are: alfalfa 6 to 8 tons, small grain hay 1.5 to 2.5 tons, and pasture 10 to 12 animal-unit-months. The content of salts and alkali can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil. Subsoiling breaks up restrictive layers and allows water and salts to move below the root zone. During reclamation, only highly salt tolerant plants should be grown. In areas where this soil has been irrigated for a long time, the content of salts in the upper 24 to 30 inches has been lowered to a satisfactory level for common salt tolerant plants.

Border, furrow, and sprinkler irrigation systems are suited to this soil. Enough water must be applied to satisfy the needs of the crop and to leach the salts and alkali out of the root zone. In most areas the soil should be leveled and smoothed to obtain uniform distribution of water and to prevent salts from accumulating in the higher lying areas. Sprinkler systems should be designed so that the water is applied at a rate that does not exceed the water intake rate of the soil.

Returning crop residue to the soil and leaving stubble on the surface increase water infiltration, reduce soil

blowing, and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing. Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress and Athel.

If this unit is used for homesite development, the main limitations are the hazard of flooding, moderate shrink-swell potential, moderately slow permeability, low strength, hazard of soil blowing, and moderate or high content of salts and alkali. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. The effects of shrinking and swelling can be minimized by using an appropriate engineering design and by backfilling with material that has a low shrink-swell potential. If this soil is used for septic tank absorption fields, longer absorption lines and the use of sandy backfill for the trench help to compensate for the moderately slow permeability. Landscaping plants that are salt- and alkali-tolerant should be used. Drainage, irrigation water management, and the addition of soil amendments can reduce the content of salts and alkali.

This map unit is in capability unit IIIs-6 (30), irrigated. and in capability subclass VIIs (30), nonirrigated.

126 Gullied land-Haploxeralfs association. This map unit is on dissected, old alluvial fans. The natural vegetation is mainly sparse shrubs and few grasses and forbs (fig. 8). Elevation is 3,800 to 4,100 feet.

This unit is 40 percent Gullied land and 40 percent Haploxeralfs. Gullied land is deeply incised remnants of alluvial fans. Slopes are dominantly undulating or gently rolling and range from 2 to 9 percent. Some slopes are 15 to 20 percent. Intermittent streams are deeply entrenched. Soil profiles have been truncated or destroyed. Haploxeralfs are on the upper part of fans, on narrow ridgetops and on the upper part of side slopes or remnant fans. Slopes are 10 to 15 percent in most areas, but some areas have slopes of 20 to 30 percent. Deep and shallow gullies are common on side slopes.

Included in this unit are small areas of Oak Glen and Avawatz soils on the lower part of side slopes and in drainageways. Also included are small areas of Bull Trail soils on the higher parts of old fans and on terrace remnants. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Gullied land formed in alluvium derived dominantly from granitic material. Soil properties and characteristics are varied because erosion along the deeply entrenched drainageways has destroyed or altered the soil profile.

Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

Haploxeralfs are very deep and well drained. They formed in alluvium derived dominantly from granitic material. Typically, the surface layer is eroded sandy loam. In some areas only 1 to 2 inches remain. The subsoil is yellowish red to yellowish brown sandy loam or sandy clay loam about 18 to 60 inches thick. The substratum is highly varied in texture and in gravel and cobble content. The degree of variation displayed in these soils is a result of erosion on side slopes and ridges of fan and terrace remnants. In some areas the surface layer and subsoil have been altered or removed. Haploxeralfs on the upper part of side slopes and on ridges of older remnant surfaces show the most development, and those on the lower part of side slopes adjacent to drainageways are less developed.

Permeability of the Haploxeralfs is moderate or moderately slow. Runoff is medium or rapid, and the hazard of water erosion is moderate or high. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat. It is also used for homesite development.

If this unit is used for homesite development, the main limitations are the shrink-swell potential, the moderately slow permeability of the subsoil, hazard of water erosion, low fertility, and slope. Buildings and roads should be designed to offset the effects of shrinking and swelling. The limitation of moderately slow permeability in the subsoil can be overcome by increasing the size of the septic tank absorption field. Steepness of slope is also a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

As much of the existing natural vegetation as feasible should be left around homesites to reduce water erosion. Protective measures such as mulching or seeding are needed to reduce water erosion on construction sites during winter. Areas disturbed during construction should be revegetated as soon as feasible. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

Gullied land and Haploxeralfs are in capability subclass VIIe (20), nonirrigated.

127 Halloran sandy loam. This very deep, moderately well drained soil is on old wind-modified river terraces. It formed in alluvium derived dominantly from granitic material. Slope is 0 to 2 percent. Slopes are broad, smooth, and nearly level and generally are slightly concave. Windblown hummocks of sand ranging from about 1 to 2 feet in height and a few small dunes are irregularly spaced over the area. Slick spots more than 50 feet in diameter are scattered over areas of this unit that are within 1 to 1.5 miles of Troy Dry Lake and areas that are in the vicinity of Newberry Springs south of the Santa Fe Railroad tracks. The natural vegetation is mainly salt tolerant shrubs, grasses, and forbs. Elevation is 1,800 to 1,850 feet.

Figure 8. A typical area of Gullied land-Haploxeralfs association. Because the soils are low in fertility, the vegetation is sparse.

Typically, the surface layer is very pale brown sand about 2 inches thick. The subsoil is reddish brown and reddish yellow sandy loam about 19 inches thick. The upper 12 inches of the substratum is yellow and brown loamy sand, and the lower part to a depth of 60 inches or more is yellow and yellowish brown, stratified sandy loam, loamy fine sand, and coarser textured material. The subsoil and substratum are moderately alkaline to very strongly alkaline. The subsoil is slightly saline to strongly saline and is very high in content of alkali.

Included in this unit are small areas of Cajon sand, loamy substratum, on river terraces and Dune land. Also included are soils that are similar to the Halloran soil but are not saline-alkali.

Permeability of this Halloran soil is moderately slow. Available water capacity is very low or low because of the content of salts and alkali. It is moderate in areas where the soil has been reclaimed. Runoff is slow, and the hazard of water erosion is none or slight. Ponding occurs between hummocks and dunes after heavy rains. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat. Small areas have been reclaimed and are used for irrigated crops such as alfalfa, small grain hay, and pasture. The unit is also used for grazing.

If this unit is used for grazing, the main limitations are low precipitation, the low to high content of salts and alkali, and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are Mediterranean schismus and filaree.

This unit is suited to irrigated crops in areas where it has been reclaimed. In areas that have not been reclaimed, it is limited by salts in the soil (electrical conductivity ranges from 4 to 45 millimhos per centimeter) and the content of alkali, which ranges from 15 to 70 percent exchangeable sodium. The effort involved in reclaiming the soil depends on the content of salts and alkali and the effectiveness of the natural drainage. Areas of this unit near Troy Dry Lake and areas south of the Santa Fe Railroad tracks in the Newberry Springs area are limited by the inadequate drainage and are poorly suited to irrigated crops. In other areas the saline-alkali content should be measured before reclamation is started to determine the proper amount of amendments needed. This unit is also limited by the hazard of soil blowing and low fertility. In areas that have not been reclaimed, it is further limited by very low and low available water capacity. Where the unit is reclaimed, estimated yields for the crops grown are: alfalfa 5 to 7 tons, small grain hay 1.5 to 2.5 tons, and pasture 9 to 10 animal-unit-months.

Moderately slow permeability of the subsoil and the problem of obtaining high quality water for leaching make reclamation difficult. Soils that have a very high percent of exchangeable sodium are even more difficult to reclaim. The content of salts and alkali can be reduced by leaching, applying the proper amount of soil amendments, and returning crop residue to the soil. Subsoiling breaks up restrictive layers and allows water and salts to move out of the root zone. During reclamation, only highly salt tolerant plants should be grown on soils with electrical conductivity of more than 16 millimhos per centimeter. Grain can be seeded simultaneously with alfalfa or pasture plants to aid in establishing new seedlings. Returning crop residue to the soil reduces surface crusting and increases the water intake rate.

Sprinkler irrigation systems are best suited to this soil. Enough water must be applied to satisfy the needs of the crop and to leach the salts and alkali out of the root zone. Sprinkler systems should be designed so that the water is applied at a rate that does not exceed the water intake rate of the soil and so that light, frequent applications can be made. In most areas the soil should be leveled and smoothed to obtain uniform distribution of water and to prevent salts from accumulating in the higher areas. Windblown sand from dunes often spreads over the soil during leveling. Water and salts can accumulate through infiltration and wicking, respectively, at the interface of the windblown sand layer and the subsoil. Adequate leaching of the subsoil reduces the content of salts and alkali and increases the permeability rate of the subsoil.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble.

The risk of flooding can be reduced by the use of levees, dikes, or diversions.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress and Athel.

This map unit is in capability unit IVs-6, irrigated, and in capability subclass VIIs (30), nonirrigated.

128 Halloran-Dune land complex, 0 to 15 percent slopes. This map unit is on old, wind-modified river terraces. The natural vegetation is mainly salt tolerant shrubs, grasses, and forbs. Elevation is 1,800 to 1,850 feet.

This unit is 50 percent Halloran sandy loam and 35 percent Dune land. The Halloran soil is on alluvial terraces and in depressional blowout areas between dunes. The surface layer and some of the subsoil have been removed in the blowout areas. Slopes generally are concave and range from 0 to 2 percent. Dune land is on randomly spaced dunes, and it has been deposited over the Halloran soil in most areas. Slopes are nearly level to rolling and range from 0 to 15 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Cajon sand and Cajon loamy sand, loamy substratum, on terraces. Also included are sandy soils that are on stable dunes and support a sparse cover of plants. Included areas make up about 15 percent of the total acreage.

The Halloran soil is very deep and moderately well drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is very pale brown sand about 2 inches thick. The subsoil is reddish brown and reddish yellow sandy loam about 19 inches thick. The upper 12 inches of the substratum is yellow and brown loamy sand, and the lower part to a depth of 60 inches is yellow and yellowish brown, stratified sandy loam, loamy fine sand, and coarser textured material. The subsoil and substratum are moderately alkaline or very strongly alkaline. The subsoil is moderately saline or strongly saline and is very high in content of alkali.

Permeability of the Halloran soil is moderately slow. Available water capacity is very low or low because of the content of salts and alkali. It is moderate where the soil has been reclaimed. Runoff is slow, and the hazard

of water erosion is none to slight. Ponding occurs between dunes for brief periods after short, heavy rains. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

Dune land is essentially barren of vegetation. Dunes are varied in shape and size. Wind sculpturing produces concave or irregular surfaces in some areas. Dunes are as much as 25 feet high but generally are less than 10 feet high. Runoff is very slow, and the hazard of water erosion is none or slight. The hazard of soil blowing is high.

This unit is used mainly as wildlife habitat. Small areas have been reclaimed and are used for irrigated crops such as alfalfa, small grain hay, and pasture. The unit is also used for grazing.

This unit is poorly suited to irrigated crops. It is limited mainly by the random spacing of large dunes and by the blowout areas. In areas that have not been reclaimed, it is limited by salts in the soil (electrical conductivity ranges from 8 to 45 millimhos per centimeter) and the content of alkali, which ranges from 15 to 70 percent exchangeable sodium. The saline-alkali content should be measured before reclamation is started to determine the proper amounts of amendments needed. This unit is also limited by the hazard of soil blowing and low fertility. In areas that have not been reclaimed, it is further limited by the very low and low available water capacity. Where the unit is reclaimed, estimated yields for the crops grown are: alfalfa 5 to 7 tons, small grain hay 1.5 to 2.5 tons, and pasture 9 to 10 animal-unit-months.

The moderately slow permeability of the subsoil and the problem of obtaining high quality water for leaching make reclamation difficult. Soils that have a very high percent of exchangeable sodium are even more difficult to reclaim. The content of salts and alkali can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil. Subsoiling breaks up restrictive layers and allows water and salts to move out of the root zone. During reclamation, only highly salt tolerant plants should be grown on soils that have electrical conductivity of more than 16 millimhos per centimeter. Grain can be planted with alfalfa or irrigated pasture simultaneously to aid in establishing new seedlings. Returning crop residue to the soil reduces surface crusting and increases the water intake rate.

Sprinkler irrigation systems are better suited to this unit than most other methods. Enough water must be applied to satisfy the needs of the crop and to leach the salts and alkali out of the root zone. Sprinkler systems should be designed so that the water is applied at a rate that does not exceed the water intake rate of the soil and so that light, frequent applications can be made. In most areas the soil should be leveled and smoothed to obtain uniform distribution of water and to prevent salts from accumulating in the higher areas. Windblown sand from dunes commonly spreads over the soil during leveling. Water and salts can accumulate through infiltration and wicking, respectively, at the interface of the windblown sand layer and the subsoil. Adequate leaching of the subsoil reduces the content of salts and alkali and increases the permeability of the subsoil.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress and Athel.

The risk of flooding can be reduced by the use of levees, dikes, or diversions.

If this unit is used for grazing, the main limitations are low precipitation, the moderate to very high content of salts and alkali, and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from soil blowing. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are Mediterranean schismus and filaree.

This map unit is in capability unit IVs-1 (30), irrigated, and in capability subclass VIIs (30), nonirrigated.

129 Hanford sandy loam, cool, 2 to 9 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are long, convex, and gently sloping or moderately sloping. In some areas slopes are undulating. Many areas are dissected by long, shallow intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 4,000 to 4,200 feet.

Typically, the surface layer is pale brown sandy loam about 12 inches thick. The underlying material to a depth of 60 inches or more is pale brown sandy loam and light yellowish brown coarse sandy loam. In some areas of similar included soils, the surface layer is loamy sand. In other areas the reaction is medium acid.

Included in this unit are small areas of Soboba gravelly sand on alluvial fans. Also included are small areas of soils that have pebbles and cobbles on the surface.

Permeability of this Hanford soil is moderately rapid. Available water capacity is moderate or high. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat and for homesite development. It can also be used for irrigated crops and grazing.

If this unit is used for homesite development, it is limited by the hazards of flooding, water erosion, and soil blowing. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding.

As much of the existing natural vegetation as feasible should be left around homesites to reduce water erosion and soil blowing. Protective measures such as mulching or seeding are needed to reduce water erosion on construction sites during winter. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This unit is suited to most crops commonly grown in the area. Estimated yields are not available. The unit is limited by the hazards of soil blowing and erosion and by slope. Sprinkler irrigation is better suited to this unit than most other methods because of the slope. Drip irrigation is also suited to orchards. These systems, if properly designed, insure better distribution of water. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop. This helps to conserve water and keep soil losses to a minimum.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and water erosion and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

If this unit is used for orchards, a cover crop should be used to reduce water erosion and soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for grazing, the main limitation is the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial plant species. Clearing in many cases has increased livestock and wildlife forage by reducing the competition from California juniper. Major forage species are desert needlegrass, red brome, and filaree.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIe (30), nonirrigated.

130 Haplargids-Calciorthids complex, 15 to 50 percent slopes. This map unit is on terrace escarpments, dissected hills, and terrace remnants that lie mainly between flood plains of the Mojave River and higher terraces. Most areas are dissected by shallow to deep intermittent drainageways. Natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 2,000 to 3,000 feet.

This unit is about 50 percent Haplargids and 25 percent Calciorthids. Haplargids are on terrace remnants and hilltops. Slopes are hilly and range from 15 to 30 percent. Calciorthids are on terrace escarpments and hillsides. Slopes are moderately steep or steep and range from 15 to 50 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Badland; Cajon soils, mainly on narrow alluvial fans in drainageways; and soils that are on hillsides and terrace escarpments and have hard, cemented caliche layers. Also included are small areas of Bryman soils and Mohave Variant loamy sand adjacent to the larger, more uniform terraces and fans. Included areas make up about 25 percent of the total acreage.

Haplargids and Calciorthids are varied in texture, color, depth, and other characteristics. The high degree of variation is a result of downcutting or truncation by the Mojave River and subsequent receding of terrace escarpments through geologic erosion.

Haplargids are very deep and well drained. They formed in alluvium derived dominantly from granitic material. The surface layer ranges from loamy fine sand to sand. The upper part of the subsoil is sandy loam or sandy clay loam and ranges from 6 to 20 inches in thickness. The lower part is soft, white caliche that has the texture of sandy clay loam or loam and grades to a loamy sand or sand substratum that extends to a depth of 60 inches or more. In some areas the surface layer and the upper part of the subsoil have been removed. In some areas Haplargids have no caliche layer or have only a very weakly developed one.

Permeability of Haplargids is moderate or moderately slow. Runoff is medium or rapid, and the hazard of water erosion is moderate or high. The hazard of soil blowing is moderate or high in areas where the surface layer has not been removed.

Calciorthids are very deep and well drained. They formed in alluvium derived dominantly from granitic material. The surface layer ranges from loamy fine sand to sand. The underlying material ranges from light yellowish brown to white sand to sandy loam that is a soft or very weakly cemented caliche layer. Thickness of the caliche layer and its depth vary. In some areas the surface layer and some of the underlying material have been removed. In some areas there are thin strata of gravel below a depth of 30 inches.

Permeability of Calciorthids is rapid or moderately rapid. Runoff is medium or rapid, and hazard of water erosion is moderate or high. The hazard of soil blowing is moderate or high.

This unit is used mainly as wildlife habitat. It is also used for grazing.

If this unit is used for grazing, the main limitations are low precipitation, the hazard of soil blowing, and the hazard of water erosion. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion and soil blowing. Plants having low forage importance but having wildlife habitat and esthetic significance are Joshua-tree and creosotebush. Major forage species are Indian ricegrass, filaree, and saltbush.

This map unit is in capability subclass VIIe (30), nonirrigated.

131 Helendale loamy sand, 0 to 2 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium derived dominantly from granitic material. Slopes are broad, smooth, slightly convex, and nearly level. Many areas are dissected by shallow intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 2,500 to 3,500 feet.

Typically, the surface layer is very pale brown loamy sand about 4 inches thick. The subsoil and the upper part of the substratum are brown, yellowish brown, and light yellowish brown sandy loam about 62 inches thick. The lower part of the substratum is yellow loamy sand to a depth of 106 inches. Clay content decreases below a depth of 30 inches. In some areas of similar included soils, the surface layer is sandy loam.

Included in this unit are small areas of Bryman loamy fine sand on terraces, Kimberlina loamy fine sand, and Cajon sand on recent fans. Also included are small areas of soils that have pebbles on the surface and small areas of soils that have slopes of as much as 3 percent.

Permeability of this Helendale soil is moderately rapid in the subsoil and upper part of the substratum, and it is rapid in the lower part of the substratum. Available water capacity is low or moderate. Runoff is medium, and the hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly for irrigated crops. The main crops are alfalfa, small grain hay, and pasture (fig. 9). The unit is also used for homesite development, livestock grazing, and wildlife habitat.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 6 to 8 tons, small grain hay 1. 5 to 2.5 tons, and pasture 8 to 10 animal-unit-months. The unit is limited by the hazard of soil blowing, high water intake rate, low or moderate available water capacity, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of the high water intake rate and low available water capacity. Sprinkler systems, if properly designed, insure better distribution of water on soils that have a sandy surface. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for homesite development, it is limited by the hazards of soil blowing and contaminating the ground water if septic tanks are used and by the hazard of sloughing. Because of the rapid permeability of the lower part of the substratum, unfiltered effluent can contaminate the ground water. Because of the sandy texture of the substratum, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. In some areas historical clearing has contributed to an increase of Indian ricegrass. Major forage species are Indian ricegrass, red brome, and filaree.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

132 Helendale loamy sand, 2 to 5 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium derived dominantly from granitic material. Slopes are broad, smooth, convex, and gently sloping. Most areas are dissected by moderately deep intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 2,700 to 3,800 feet.

Typically, the surface layer is very pale brown loamy sand about 4 inches thick. The subsoil and the upper part of the substratum are brown, yellowish brown, and light yellowish brown sandy loam about 62 inches thick. The lower part of the substratum is yellow loamy sand to

Figure 9. Helendale loamy sand, 0 to 2 percent slopes, used for alfalfa hay. The alfalfa is grazed by sheep when other feed is not available.

a depth of 106 inches. Clay content decreases below a depth of 30 inches. In some areas of similar included soils, the surface layer is sandy loam.

Included in this unit are small areas of Cajon sand on recent fans. Also included are small areas of Lavic loamy fine sand and Cave loam on fans and remnant surfaces.

Permeability of this Helendale soil is moderately rapid in the subsoil and rapid in the lower part of the substratum. Available water capacity is low or moderate. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used as wildlife habitat. It is also used for irrigated crops such as alfalfa, small grain hay, and pasture and for grazing.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 6 to 8 tons, small grain hay 1.5 to 2.5 tons, and pasture 8 to 10 animal-unit-months. The unit is limited by slope, the hazard of soil blowing, high water intake rate, low or moderate available water capacity, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of the slope, high water intake rate, and low available water capacity. Sprinkler systems, if properly designed, insure better distribution of water on sloping soils and on soils that have a sandy surface layer. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water and reduce erosion.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. In some areas historical clearing has contributed to an increase of Indian ricegrass. Major forage species are Indian ricegrass, red brome, and filaree.

This unit is suited to homesite development. If it is developed for this use, it is limited by the hazards of soil blowing, contamination of the ground water if septic tanks are used, and sloughing. Because of the rapid permeability of the lower part of the substratum, unfiltered effluent can contaminate the ground water. Because of the sandy texture of the substratum, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

133 Helendale-Bryman loamy sands, 2 to 5 percent slopes. This map unit is on terraces and old alluvial fans. Many areas are dissected by deep intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 2,900 to 3,200 feet.

This unit is 50 percent Helendale loamy sand and 35 percent Bryman loamy sand. Helendale and Bryman soils are on broad, smooth terraces and old alluvial fans. Slopes are convex and gently sloping to undulating. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Cajon sand in drainageways and on recent alluvial fans and Mohave Variant loamy sand on terraces near the Mojave River or on terrace remnants. Also included are small areas of soils that have slopes of 6 to 12 percent and are on toe slopes and soils that are hummocky. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Helendale soil is very deep and well drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is very pale brown loamy sand about 6 inches thick. The subsoil and substratum are brown, yellowish brown, and light yellowish brown sandy loam to a depth of 66 inches. Clay content decreases below a depth of 30 inches. In some areas of similar included soils, the substratum is yellow loamy sand below a depth of 40 inches, and in some areas the surface layer is loamy fine sand.

Permeability of the Helendale soil is moderately rapid. Available water capacity is low or moderate. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

The Bryman soil is very deep and well drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is light yellowish brown loamy fine sand about 8 inches thick. The upper 4 inches of the subsoil is brown sandy loam, the next 32 inches is reddish yellow sandy clay loam, and the lower part to a depth of 60 inches or more is light yellowish brown loamy sand. In some areas of similar included soils, the surface layer is loamy sand.

Permeability of the Bryman soil is moderately slow. Available water capacity is moderate or high. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. In some areas historical clearing has contributed to an increase of Indian ricegrass. Major forage species are Indian ricegrass, red brome, and filaree.

If this unit is used for homesite development, the Helendale part is limited by the hazards of soil blowing, contamination of the ground water if septic tanks are used, and sloughing. The Bryman part is limited by the moderate shrink-swell potential, low strength, the moderately slow permeability of the subsoil, the seepage of effluent from septic tanks, and the hazard of soil blowing. Buildings and roads should be designed to offset the effects of shrinking and swelling and of low strength. If used as a base for roads, the upper part of the soil can be mixed with the underlying loamy sand to increase its strength and stability.

The limitation of moderately slow permeability in the subsoil can be overcome by increasing the size of the septic tank absorption field or by increasing the depth of the trenches so that they reach below the restrictive layer. However, because of the rapid permeability of the substratum, unfiltered effluent can contaminate the ground water. Because of the sandy texture of the substratum, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This unit is suited to irrigated crops. If it is used as cropland, the limitations are slope, the hazard of soil blowing, high water intake rate, and low fertility. The Helendale soil is also limited by the low or moderate available water capacity. The Bryman soil is also limited by the moderately slow permeability of the subsoil and moderate available water capacity.

Management of this unit as cropland is difficult if both soils in the unit are in the same field. The frequency of irrigation and the amount of water applied should be designed according to the available water capacity of the dominant soil in each field. Sprinkler systems, if properly designed, insure better distribution of water on sloping soils and on soils that have a sandy surface layer.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain, alfalfa, and pasture plants can be seeded simultaneously to protect seedlings from soil blowing. Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

134 Hesperia loamy fine sand, 2 to 5 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are long, smooth, slightly convex, and gently sloping. Many areas are dissected by long, shallow drainageways. The natural vegetation is mainly juniper, desert shrubs, grasses, and forbs. Elevation is 3,400 to 4,000 feet.

Typically, the surface layer is light yellowish brown loamy fine sand about 6 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown and very pale brown sandy loam. In some areas of similar included soils, the surface layer is sandy loam.

Included in this unit are small areas of Cajon sand on the lower fans and Wrightwood loamy sand and Bull Trail sandy loam on higher fans. Also included are small areas of soils that are similar to this Hesperia soil but have strata of reddish yellow or reddish brown sandy loam or sandy clay loam about 12 inches thick at a depth of about 48 inches. Also included are soils that are similar to this Hesperia soil but are noncalcareous throughout or have slopes of 0 to 2 percent.

Permeability of this Hesperia soil is moderately rapid. Available water capacity is low or moderate. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the main limitation is the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive soil blowing. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial plant species. Clearing in many cases has increased livestock and wildlife forage by reducing the competition from California juniper. Major forage species are desert needlegrass, bluegrass, and red brome.

If this unit is used for homesite development, it is limited by the hazard of soil blowing. As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This unit is suited to irrigated crops. If it is used as cropland, it is limited by the slope, the hazard of soil blowing, high water intake rate, low or moderate available water capacity, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of the slope, high water intake rate, and low or moderate available water capacity. Sprinkler systems, if properly designed, insure better distribution of water on sandy and sloping soils. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water and reduce soil erosion.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

Planting windbreaks around fields also reduces soil blowing.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

135 Joshua loam, 2 to 5 percent slopes. This moderately deep, well drained soil is on old stable terraces that have a desert pavement (fig. 10). It formed in alluvium derived from mixed sources. Slopes are long, broad, slightly convex, and gently sloping. Most areas are dissected by moderately deep intermittent drainageways. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,600 to 3,000 feet.

Typically, 70 to 90 percent of the surface layer is covered by a desert pavement of varnished gravel and cobbles. The surface layer is light yellowish brown loam about 3 inches thick. The subsoil is brown and reddish brown gravelly sandy clay loam and reddish brown gravelly sandy loam about 17 inches thick. The upper 19 inches of the substratum is brown very gravelly coarse sandy loam that has discontinuous silica lenses, and the lower part to a depth of 55 inches is white very gravelly loamy coarse sand that is extremely hard. The subsoil is

Figure 10. An area of Joshua loam, 2 to 5 percent slopes, in foreground. In background, palisades along the Mojave River are in an area of Badland.

slightly saline to strongly saline and is high in content of alkali. Depth to the discontinuous silica-cemented hardpan is 20 to 40 inches. In some areas the desert pavement is weakly varnished.

Included in this unit are small areas of Cajon gravelly sand on fans. Also included are small areas of soils on the upper part of fans that are similar to this Joshua soil but have slopes of more than 15 percent.

Permeability of this Joshua soil is moderately slow above the discontinuous silica-cemented hardpan and slow in the hardpan. Available water capacity is very low or low. Runoff is medium, and the hazards of water erosion and soil blowing are slight where the surface is protected by the desert pavement. Effective rooting depth is 20 to 40 inches.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to avoid disturbing the desert pavement. If the desert pavement surface is disturbed, water erosion and soil blowing will result. Gullying and sediment deposition caused by channeling of excess runoff can occur during high intensity storms. Major forage species are filaree and fiddleneck.

This map unit is in capability subclass VIIe (30), nonirrigated.

136 Joshua loam, 9 to 15 percent slopes. This moderately deep, well drained soil is on ridgetops, side slopes, and toe slopes of old terraces that have a desert pavement. It formed in alluvium derived from mixed sources. Slopes are rather short, convex, and moderately steep. A few small gullies dissect most

areas. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,600 to 3,000 feet.

Typically, 70 to 80 percent of the surface layer is covered by a desert pavement of varnished gravel and cobbles. The surface layer is pale brown loam about 5 inches thick. The subsoil is reddish brown or strong brown gravelly sandy clay loam and gravelly sandy loam about 14 inches thick. The upper 20 inches of the substratum is brown very gravelly coarse sandy loam that has discontinuous silica lenses, and the lower part to a depth of 50 inches is white gravelly loamy coarse sand that is extremely hard. The subsoil is moderately saline or strongly saline and is high in content of alkali. Depth to the discontinuous silica-cemented hardpan is 20 to 40 inches. In some areas the desert pavement is very weakly varnished.

Included in this unit are small areas of Joshua loam that is on stable terraces and has slopes of less than 9 percent and Cajon gravelly sand on fans. Also included are small areas of soils that are similar to this Joshua soil but have slopes of more than 15 percent.

Permeability of this Joshua soil is moderately slow above the discontinuous silica hardpan and slow in the hardpan. Available water capacity is very low or low. Runoff is medium or rapid, and the hazard of water erosion is slight because the surface is protected by the desert pavement. The hazard of soil blowing is slight where the surface is protected by the desert pavement. Effective rooting depth is 20 to 40 inches.

This unit is mainly used as wildlife habitat. It is also used for grazing.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to avoid disturbing the desert pavement. If the desert pavement surface is disturbed, water erosion and soil blowing will result. Gullying and sediment deposition caused by channeling of excess runoff can occur during high intensity storms. Major forage species are filaree and fiddleneck.

This map unit is in capability subclass VIIe (30), nonirrigated.

137 Kimberlina loamy fine sand, cool, 0 to 2 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed sources. Slopes are broad, long, smooth, slightly convex, and nearly level. Many areas are dissected by long, shallow intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 1,800 to 3,200 feet.

Typically, the surface layer is very pale brown loamy fine sand about 7 inches thick. The upper 44 inches of the underlying material is pale brown and very pale brown sandy loam, and the lower part to a depth of 60 inches or more is yellowish brown loam. In some areas of similar included soils, the surface layer is loamy sand.

Included in this unit are small areas of Cajon sand on the upper part of fans, Helendale loamy sand on old fans, and soils that have pebbles and cobbles on the surface. Also included are small areas of soils along intermittent stream channels near the Mojave River that are similar to this Kimberlina soil but are stratified with coarse sand and gravel below a depth of 30 inches. Also included are small areas of soils near Newberry Springs that are similar to this Kimberlina soil but are strongly saline and high in content of alkali in the upper 18 inches and have thin strata of loam between depths of 10 and 30 inches.

Permeability of this Kimberlina soil is moderate. Available water capacity is moderate or high. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing. It is also used for irrigated crops, mainly alfalfa, small grain, hay, and pasture.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. In some areas historical clearing has contributed to an increase of Indian ricegrass. Major forage species are Indian ricegrass, salt bush, and filaree.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 6 to 8 tons, small grain hay 1.5 to 2.5 tons, and pasture 8 to 10 animal-unit-months. The unit is limited by the moderate available water capacity, hazard of soil blowing, high water intake rate, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of the high water intake rate. Sprinkler systems, if properly designed, insure better distribution of water on soils that have a sandy surface. Border and furrow irrigation are also suited to this unit. In designing either type of irrigation system, the moderate or high available water capacity should be considered in determining the rate, amount, and frequency of water application. Irrigation water should be properly managed to meet the needs of the crop.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

138 Kimberlina loamy fine sand, cool, 2 to 5 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed sources. Slopes are broad, smooth, convex, and gently sloping. Most areas are dissected by long intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 1,800 to 3,200 feet.

Typically, the surface layer is very pale brown loamy fine sand about 7 inches thick. The underlying material to a depth of 60 inches or more is pale brown and very pale brown sandy loam. In some areas of similar included soils, the surface layer is loamy sand.

Included in this unit are small areas of Cajon sand on the upper part of fans, Helendale loamy sand on old fans, and Kimberlina soils that have slopes of more than 6 percent. Also included are small areas of soils that have pebbles on the surface.

Permeability of this Kimberlina soil is moderately rapid. Available water capacity is moderate or high. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat, livestock grazing, and homesite development. It is also used for irrigated crops, mainly alfalfa, small grain hay, and pasture (fig. 11).

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. In some areas historical clearing has helped to cause an increase of Indian ricegrass. Major forage species are Indian ricegrass, saltbush, and filaree.

If this unit is used for homesite development, it is limited by the hazard of soil blowing. As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 6 to 8 tons, small grain hay 1.5 to 2.5 tons, and pasture 8 to 10 animal-unit-months. The unit is limited by slope, the moderate available water capacity, the hazard of soil blowing, the high water intake rate, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of the high water intake rate. Sprinkler systems, if properly designed, insure better distribution of water on sloping and sandy soils. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing. Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

139 Kimberlina gravelly sandy loam, cool, 2 to 5 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed sources. Slopes are broad, long, smooth, convex, and gently sloping. Some areas are dissected by shallow and deep gullies, and parts of the area have undulating slopes. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 3,000 to 4,000 feet.

Typically, the surface layer is pale brown gravelly sandy loam about 7 inches thick. The underlying material to a depth of 60 inches or more is very pale brown gravelly sandy loam.

Included in this unit are areas of Cajon soils on the upper part of fans, Manet loamy sand on the lower part of fans, and Kimberlina soils that have an elevation of 4,000 to 4,300 feet. Also included are areas of soils that have cobbles on the surface.

Permeability of this Kimberlina soil is moderately rapid. Available water capacity is moderate. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more.

This unit is used as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in barren areas and lower overall production. Major forage species are red brome and filaree.

This map unit is in capability subclass VIIe (30), nonirrigated.

140 Lavic loamy fine sand. This very deep, moderately well drained soil is on alluvial fans and basin

Figure 11. Harvested alfalfa hay on irrigated Kimberlina loamy fine sand, cool, 2 to 5 percent slopes. Foreground vegetation is Joshua-tree, desert shrubs, grasses, and forbs.

rims. It formed in alluvium derived dominantly from granitic material. Slopes are broad, long, slightly convex, and nearly level to gently sloping, and they range from 0 to 5 percent. Many areas are dissected by shallow intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 2,800 to 3,100 feet.

Typically, the surface layer is pale brown loamy fine sand about 10 inches thick. The subsoil is brown loamy sand about 10 inches thick. The next layer, to a depth of 49 inches, is weakly and discontinuously cemented caliche that is light gray, pale brown, or white sandy loam and loam. The substratum to a depth of 60 inches or more is light yellowish brown loamy sand. In some areas of similar included soils, the surface layer is sandy loam or loamy sand.

Included in this unit are small areas of Cajon sand on the upper part of fans and Cave loam and Kimberlina loamy fine sand on the lower margins of alluvial fans. Also included are small areas of soils that have pebbles and cobbles on the surface.

Permeability of this Lavic soil is moderate. Available water capacity is low or moderate. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Roots can penetrate the caliche layer readily when it is wet, but the caliche layer is hard when dry. The degree of cementation varies from place to place. Effective rooting depth is somewhat restricted by the caliche layer, but it is 60 inches or more if the soil is irrigated.

This unit is used mainly as wildlife habitat and for grazing. It is also used for irrigated crops, mainly alfalfa, small grain hay, and pasture, and for homesite development.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing

is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Clearing or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are Indian ricegrass, brome, and saltbush.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 5 to 7 tons, small grain hay 2 tons, and pasture 7 to 9 animal-unit-months. The unit is limited by slope, the hazard of soil blowing, the high water intake rate, the low or moderate available water capacity, the high content of lime, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of the high water intake rate and low or moderate available water capacity. Sprinkler systems, if properly designed, insure better distribution of water on sloping and sandy soils. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress and Athel.

If this unit is used for homesite development, it is limited by the moderate permeability, hazard of soil blowing, high content of lime, the rapid permeability of the substratum, and a hazard of sloughing. The limitation of the moderate permeability can be overcome by increasing the size of the septic tank absorption field or by placing the filter tile below the moderately permeable layer. Because of the rapid permeability of the substratum, unfiltered effluent can contaminate the ground water. The weak cementation in the caliche layer of this soil can cause onsite sewage disposal systems to function poorly or to fail. Because of the sandy texture of the substratum, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Plants that are highly sensitive to lime-induced chlorosis should not be used for landscaping. Mulching, fertilizing, and irrigating are needed to establish and maintain landscaping plants.

This map unit is in capability unit IIIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

141 Lovelace loamy sand, 5 to 9 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in mixed alluvium derived dominantly from granitic material. Slopes are long, smooth, slightly convex, and gently sloping to moderately sloping. Many areas are dissected by moderately deep intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 3,000 to 3,300 feet.

Typically, the surface layer is light brown loamy sand about 6 inches thick. The upper 13 inches of the underlying material is light brown loamy sand, the next layer, to a depth of 33 inches, is white loamy sand caliche, and the lower part to a depth of 60 inches or more is reddish yellow and light yellowish brown sand. The caliche layer is either massive or weakly cemented. In some areas of similar included soils, the surface layer is sand.

Included in this unit are small areas of Cajon sand on the upper part of fans. Also included are small areas of soils that are similar to this Lovelace soil but have some silica cementation in the subsoil or have slopes of less than 5 percent.

Permeability of this Lovelace soil is moderate. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Roots can penetrate the caliche layer readily when it is wet, but the caliche layer is hard when dry. Effective rooting depth is somewhat restricted by the caliche layer, but it is 60 inches or more if the soil is irrigated.

This unit is used as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from soil blowing. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are Indian ricegrass and filaree.

If this unit is used for homesite development, it is limited by the moderate permeability, hazard of soil blowing, high content of lime, and hazard of sloughing. The limitation of moderate permeability can be overcome by increasing the size of the septic tank absorption field or by placing the filter tile below the moderately permeable layer. Onsite sewage disposal systems will function poorly or fail where the caliche layer is weakly cemented. Because of the sandy texture of the soil, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil

blowing. Among the trees most suitable for use in windbreaks are Arizona cypress and Athel. Plants that are highly sensitive to lime-induced chlorosis should not be used for landscaping. Mulching, fertilizing, and irrigating are needed to establish and maintain landscaping plants.

This map unit is in capability subclass VIIe (30), nonirrigated.

142 Lucerne sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium derived dominantly from granitic material. Slopes are broad, smooth, slightly convex, and nearly level. Many areas are dissected by shallow intermittent drainageways. The natural vegetation is mainly juniper, desert shrubs, grasses, and forbs. Elevation is 2,900 to 3,300 feet.

Typically, the surface layer is pale brown sandy loam about 2 inches thick. The subsoil is light yellowish brown and brown sandy loam about 60 inches thick. Below this to a depth of 76 inches is a buried subsoil of reddish yellow sandy loam. In some areas of similar included soils, the surface layer is loamy sand.

Included in this unit are small areas of Hesperia loamy fine sand on fans, Wasco sandy loam on recent fans, and Bryman loamy fine sand on terraces.

Permeability of this Lucerne soil is moderately rapid. Available water capacity is moderate. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for homesite development. It is also used for irrigated crops, mainly alfalfa, pasture, and small grain hay, and for grazing.

If this unit is used for homesite development, it is limited by the hazard of soil blowing. As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 7 to 9 tons, small grain hay 1.5 to 2.5 tons, and pasture 10 to 12 animal-unit-months. The unit is limited by the hazard of soil blowing, the moderate available water capacity, and low fertility. Sprinkler, border, and furrow irrigation are suited to this unit. In designing the irrigation system, the moderate available water capacity should be considered in determining the rate, amount, and frequency of water application. Irrigation water should be managed to meet the needs of the crop. This helps to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for grazing, the main limitation is the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Controlled burning or thinning increases the production of forage by reducing competition form California juniper. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Major forage species are desert needlegrass, brome, and filaree.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

143 Lucerne sandy loam, 2 to 5 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium derived dominantly from granitic material. Slopes are broad, smooth, convex, and gently sloping to undulating. Many areas are dissected by shallow intermittent drainageways. The natural vegetation is mainly juniper, desert shrubs, grasses, and forbs. Elevation is 2,900 to 3,400 feet.

Typically, the surface layer is pale brown sandy loam about 6 inches thick. The subsoil is light yellowish brown and brown sandy loam to a depth of 60 inches or more.

Included in this unit are small areas of Hesperia loamy fine sand on fans, Wasco sandy loam on recent fans, and Bryman loamy fine sand on terraces.

Permeability of this Lucerne soil is moderately rapid. Available water capacity is moderate. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat, for homesite development, and for grazing.

If this unit is used for homesite development, it is limited by the hazard of soil blowing. As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

If this unit is used for grazing, the main limitation is the hazard of soil blowing. Grazing is limited to a few weeks

in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Controlled burning or thinning increases the production of forage by reducing competition from California juniper. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Major forage species are desert needlegrass, brome, and filaree.

This unit is suited to irrigated crops. Estimated yields of the following crops are: alfalfa 7 to 9 tons, small grain hay 1.5 to 2.5 tons, and pasture 10 to 12 animal-unit-months. The unit is limited by the slope, the hazard of soil blowing, the moderate available water capacity, and low fertility. Sprinkler irrigation is better suited to this unit then most other methods because of the slope. Sprinkler systems, if properly designed, insure better distribution of water on sloping soils. Irrigation should be properly managed to meet the needs of the crop and to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing. Planting windbreaks around fields also reduces soil blowing.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

144 Manet coarse sand, 2 to 5 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from dark-colored micaceous minerals. Slopes are broad, long, smooth, and gently sloping. Most areas are dissected by long, moderately deep intermittent drainageways. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 3,100 to 3,500 feet.

Typically, the surface layer is light brownish gray coarse sand about 3 inches thick. The upper 39 inches of the underlying material is grayish brown sand, gray loamy sand, and thin strata of fine sandy loam, and the lower part to a depth of 60 inches or more is gray fine sandy loam that has thin strata of loamy fine sand. In some areas of similar included soils, the surface layer is loamy sand.

Included in this unit are small areas of Cajon sand on fans that are dominantly granitic alluvium and Manet loamy sand, loamy substratum, on the lower margins of fans. Also included are small areas of soils that have pebbles on the surface and Manet soils that have slopes of less than 2 percent.

Permeability of this Manet soil is moderately rapid. Available water capacity is low or moderate. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat and for grazing. It is also used for irrigated crops such as alfalfa, small grain hay, and pasture, and for homesite development.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. In some areas historical clearing has contributed to an increase of Indian ricegrass. Major forage species are Indian ricegrass, red brome, and filaree.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 6 to 8 tons, small grain hay 1.5 to 2.5 tons, and pasture 8 to 10 animal-unit-months. The unit is limited by the slope, the hazard of soil blowing, the high water intake rate, the low or moderate available water capacity, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of slope, the high water intake rate, and the low or moderate available water capacity. Sprinkler systems, if properly designed, insure better distribution of water on sloping and sandy soils. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water and reduce erosion.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for homesite development, it is limited by the hazards of flooding, sloughing, and soil blowing. Protection from flooding should be considered. Dikes and diversions that have outlets to bypass floodwater can be used to protect buildings and onsite sewage disposal systems. Because of the sandy texture of the soil, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants

can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability unit IIIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

145 Manet cobbly coarse sand, 2 to 9 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from dark-colored micaceous minerals. Slopes are broad, long, smooth, and gently sloping to moderately sloping. Most areas are dissected by long, deep intermittent drainageways. Natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 3,500 to 3,900 feet.

Typically, the surface layer is light brownish gray cobbly coarse sand about 10 inches thick. The underlying material to a depth of 60 inches or more is gray and light brownish gray loamy sand that has a thin strata of gray fine sandy loam.

Included in this unit are small areas of Manet coarse sand on the lower part of fans and Cajon sand on fans that are dominantly granitic alluvium. Also included are small areas of soils that have cobbles and stones on the surface.

Permeability of this Manet soil is moderately rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more. The soil is subject to occasional periods of brief flooding.

This unit is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased water erosion, barren areas, and lower overall production. Cobbles, stones, and large pebbles on the surface layer are a limitation to animal and vehicular traffic. Major forage species are Indian ricegrass, desert needlegrass, and filaree.

If this unit is used for homesite development, the main limitations are the hazard of flooding, the hazard of sloughing, and the hazard of water erosion. Protection from flooding should be considered. Dikes and diversions that have outlets to bypass floodwater can be used to protect buildings and onsite sewage disposal systems. Because of the sandy texture of the soils, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites. Windbreaks can be used to provide protection from the wind. Among the trees most suitable for use in windbreaks are Arizona cypress and aleppo pine. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability subclass VIIe (30), nonirrigated.

146 Manet loamy sand, loamy substratum, 0 to 2 percent slopes. This very deep, well drained soil is on the lower margins of alluvial fans. It formed in alluvium derived dominantly from dark-colored micaceous minerals. Slopes are broad, long, slightly convex, and nearly level. Some areas are dissected by shallow drainageways. Natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,800 to 2,900 feet.

Typically, the surface layer is light brownish gray loamy sand about 6 inches thick. The upper 40 inches of the underlying material is light gray and light brownish gray loamy fine sand and loamy sand and strata of sandy loam, and the lower part to a depth of 60 inches or more is loam and clay loam and strata of silty material. The underlying material is slightly saline. In some areas of similar included soils, the surface layer is sand.

Included in this unit are small areas of Manet fine sandy loam on low fans, Manet coarse sand on the upper part of fans, and Cajon sand on fans that are dominantly granitic alluvium. Also included are small areas of soils that are similar to this Manet soil but are on basin rims and are strongly saline-alkali throughout or are on basin rims and the lower margins of fans and are stratified silt loam to silty clay to a depth of about 48 inches. There commonly is a water table perched above the silty clay layer when the soil is being irrigated.

Permeability of this Manet soil is moderately rapid to a depth of 46 inches and is moderately slow below this depth. Available water capacity is low or moderate, depending on the degree of stratification and the salt content. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Soluble gypsum is plentiful. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat and for grazing. It is also used for irrigated crops such as alfalfa and small grain hay and for homesite development.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. In some areas historical clearing has contributed to an increase of Indian ricegrass. Major forage species are Indian ricegrass, filaree, and red brome.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 7 to 9 tons, small grain hay 1.5 to 2.5 tons, and pasture 10 to 12 animal-unit-months. The unit is limited by salts, the

hazard of soil blowing, high water intake rate, low or moderate available water capacity, and low fertility. The soluble salts above the substratum leach out quickly if the soil is irrigated. Sprinkler systems, if properly designed, insure better distribution of water. Border and furrow irrigation systems are also suited to this unit. In designing either type of irrigation system, the low or moderate available water capacity should be considered in determining the rate and frequency of application and the amount of water to use. Irrigation water should be properly managed to meet the needs of the crop.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

Planting windbreaks around fields reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for homesite development, it is limited by the hazard of flooding, moderate shrink-swell potential, low strength, the moderately slow permeability of the subsoil, the hazard of sloughing, and the hazard of soil blowing. Buildings and roads should be designed to offset the effects of shrinking and swelling. If used as a base for roads, the clay loam layer can be mixed with sand to increase its strength and stability. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding.

The limitation of moderately slow permeability in the subsoil can be overcome by increasing the size of the septic tank absorption field. Because of the sandy texture of the soil, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

147 Manet fine sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on low alluvial fans along intermittent drainageways. It formed in alluvium derived dominantly from dark-colored micaceous minerals. Slopes are long, narrow, slightly convex, and nearly level. Most areas are dissected by long, very deep intermittent drainageways. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,850 to 3,100 feet.

Typically, the surface layer is gray fine sandy loam about 12 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and gray sand and loamy sand and strata of gray fine sandy loam. In some areas of similar included soils, the surface layer is silt loam or very fine sandy loam. In some areas of similar included soils, the surface layer is as much as 16 inches thick.

Included in this unit are small areas of Manet coarse sand on the upper part of fans and Manet loamy sand, loamy substratum, on the lower margins of fans.

Permeability of this Manet soil is moderately rapid. Available water capacity is low or moderate. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. In some areas historical clearing has contributed to an increase of Indian ricegrass. Major forage species are Indian ricegrass, red brome, and filaree.

This map unit is in capability subclass VIIe (30), nonirrigated.

148 Mirage sandy loam, 2 to 5 percent slopes. This very deep, well drained soil is on old terraces that have a desert pavement. It formed in alluvium derived dominantly from granitic material. Slopes are long, broad, convex, and moderately sloping. Most areas are dissected by deep intermittent drainageways. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 3,000 to 3,400 feet.

Typically, 70 to 90 percent of the surface is covered by a desert pavement of varnished gravel and cobbles. The surface layer and upper part of the subsoil are light yellowish brown and brown sandy loam about 5 inches thick. The next 16 inches of the subsoil is yellowish red sandy clay loam, and the lower part to a depth of 39 inches is reddish yellow gravelly sandy loam. The substratum is very pale brown gravelly loamy sand to a depth of 60 inches. The subsoil is strongly saline and is high in content of alkali. In some areas the desert pavement is weakly varnished.

Included in this unit are small areas of Nebona sandy loam on old terrace remnants, Cuddeback sandy loam

on terraces, and soils that are similar to this Mirage soil but have an overwash of volcanic pebbles and cobbles that are not varnished, have a gravelly clay loam subsoil, and are on short slopes of 5 to 8 percent near Stoddard Mountain and Black Mountain. Also included are small areas of soils that are similar to this Mirage soil but are free of salts and alkali throughout and soils that have a desert pavement, are on old terraces, and have some discontinuous, weak silica cementation and small, thin, discontinuous lenses of a silica hardpan below the subsoil.

Permeability of the Mirage soil is moderately slow. Available water capacity is very low or low. Runoff is medium, and the hazard of water erosion is slight because the surface is protected by the desert pavement. The hazard of soil blowing is slight where the surface is protected. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. If the desert pavement is disturbed, increased water erosion and soil blowing will result. Gullying and sediment deposition caused by channeling of excess runoff can occur during high intensity storms. Major forage species are filaree and fiddleneck.

This map unit is in capability subclass VIIe (30), nonirrigated.

149 Mirage-Joshua complex, 2 to 5 percent slopes. This map unit is on old terraces that have a desert pavement. Most areas are dissected by deep intermittent drainageways. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,600 to 3,000 feet.

This unit is 50 percent Mirage sandy loam and 30 percent Joshua loam. Mirage and Joshua soils are on stable positions of terraces between drainageways that have a weakly to strongly developed desert pavement. Slopes are long, narrow to broad, and gently sloping, and they range from 2 to 5 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit on terraces are small areas of Nebona sandy loam, Cuddeback sandy loam, and soils that have a desert pavement, a yellowish red sandy loam subsoil, and a sodium adsorption ratio of more than 13. Also included on terraces are soils that have a desert pavement and some discontinuous, weak silica cementation and small thin pieces of a silica hardpan in the subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Mirage soil is very deep and well drained. It formed in alluvium derived dominantly from granitic material. Typically, 70 to 90 percent of the surface is covered by a desert pavement of varnished gravel and cobbles. The surface layer and the upper part of the subsoil are light yellowish brown and brown sandy loam about 5 inches thick. The next 16 inches of the subsoil is reddish brown gravelly sandy clay loam, and the lower part to a depth of 39 inches is reddish yellow gravelly sandy loam. The substratum is very pale brown gravelly loamy sand to a depth of 60 inches or more. The subsoil is strongly saline and is high in content of alkali. In some areas of similar included soils, the surface layer is loam, and in some areas the desert pavement is weakly varnished.

Permeability of the Mirage soil is moderately slow. Available water capacity is very low or low. Runoff is medium, and the hazards of water erosion and soil blowing are slight where the surface is protected by the desert pavement. Effective rooting depth is 60 inches or more.

The Joshua soil is moderately deep and well drained. It formed in alluvium derived from mixed sources. Typically, 70 to 90 percent of the surface is covered by a desert pavement of varnished gravel and cobbles. The surface layer is light yellowish brown loam about 3 inches thick. The subsoil is brown and reddish brown gravelly sandy clay loam and reddish brown gravelly sandy loam about 17 inches thick. The upper 19 inches of the substratum is brown very gravelly coarse sandy loam that has discontinuous silica lenses, and the lower part to a depth of 55 inches is white very gravelly loamy coarse sand that is extremely hard. The subsoil is moderately saline or strongly saline and is high in content of alkali. Depth to a discontinuous, silica-cemented hardpan is 20 to 40 inches. In some areas of similar included soils, the surface layer is sandy loam, and in some areas the desert pavement is weakly varnished.

Permeability of the Joshua soil is moderately slow in the subsoil and slow in the hardpan. Available water capacity is very low or low. Runoff is medium, and the hazard of water erosion is slight because the surface is protected by the desert pavement. The hazard of soil blowing is slight where the surface is protected. Effective rooting depth is 20 to 40 inches.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. If the desert pavement is disturbed, increased water erosion and soil blowing will result. Gullying and sediment deposition caused by channeling of excess runoff can occur during high intensity storms. Major forage species are filaree and fiddleneck.

This map unit is in capability subclass VIIe (30), nonirrigated.

150 Mohave Variant loamy sand, 0 to 2 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium derived dominantly from granitic material. Slopes are broad, moderately long, convex, and nearly level. Many areas are dissected by shallow intermittent drainageways. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 1,800 to 2,800 feet.

Typically, the surface layer is light brown loamy sand about 7 inches thick. The subsoil is reddish yellow and pink sandy clay loam about 10 inches thick. The upper 9 inches of the substratum is white sandy clay loam, and the lower part to a depth of 60 inches or more is very pale brown loamy sand. In some areas of similar included soils, the surface layer is sandy loam.

Included in this unit are small areas of Nebona sandy loam and Cuddeback sandy loam on terraces. Also included are small areas of soils that are similar to this Mohave Variant soil but have slopes of more than 2 percent or have thin strata of pebbles in the lower part of the substratum.

Permeability of this Mohave Variant soil is moderately slow. Available water capacity is moderate. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

This unit is used as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are filaree and spiny hopsage.

This map unit is in capability subclass VIIe (30), nonirrigated.

151 Nebona-Cuddeback complex, 2 to 9 percent slopes. This map unit is on terraces and old alluvial fans that have a gravel desert pavement. Most areas are incised by moderately deep or shallow intermittent stream channels. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 1,800 to 3,400 feet.

This unit is 60 percent Nebona sandy loam and 20 percent Cuddeback sandy loam. The Nebona soil is on toe slopes of dissected terraces near intermittent stream channels that have cut and exposed the silica-cemented hardpan in some areas. The Cuddeback soil is on the broader parts of terraces and on fans. Slopes of both soils are undulating or gently rolling and range from 2 to 9 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of soils that have a desert pavement, are on old terraces, and have some discontinuous weak silica-cemented hardpan below the subsoil. Also included are areas of Cajon gravelly sand on narrow alluvial fans between terraces, patchy areas of soils that have a very weakly developed subsoil under a gravel desert pavement, small areas of soils that are similar to the Cuddeback soil but have a loamy sand subsoil over a silica-cemented hardpan, and small areas of soils on dissected fans that have slopes of 9 to 30 percent. Included areas make up about 20 percent of the total acreage.

The Nebona soil is shallow and well drained. It formed in alluvium derived from mixed sources. Typically, 40 to 60 percent of the surface is covered by a desert pavement of varnished gravel and cobbles. The surface layer is light yellowish brown sandy loam about 2 inches thick. The upper 6 inches of the underlying material is light yellowish brown fine sandy loam, the next layer to a depth of 12 inches is a silica-cemented hardpan, and the lower part to a depth of 65 inches is stratified very pale brown gravelly sand and gravelly loamy sand and yellow sandy loam. The underlying material is moderately alkaline or strongly alkaline, slightly saline to strongly saline, and high in content of alkali. Depth to the hardpan ranges from 6 to 14 inches. In some areas of similar included soils, the desert pavement is not varnished, and in some areas the surface layer is loamy sand.

Permeability of the Nebona soil is moderately rapid above the hardpan and very slow in the hardpan. Available water capacity is very low. Runoff is medium or rapid, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is slight where the surface is protected. Effective rooting depth is 6 to 14 inches.

The Cuddeback soil is moderately deep and well drained. It formed in alluvium derived from mixed sources. Typically, 40 to 60 percent of the surface is covered by a desert pavement of varnished gravel and cobbles. The surface layer is pale brown sandy loam about 3 inches thick. The upper part of the subsoil is yellowish red sandy loam, reddish brown gravelly sandy clay loam, and yellowish red gravelly sandy loam about 24 inches thick. The lower part of the subsoil to a depth of 34 inches is strong brown loamy sand over a silica-cemented hardpan. The subsoil is slightly saline. Depth to the hardpan ranges from 20 to 40 inches. In some areas the desert pavement is not varnished, and in some areas of similar included soils, the surface layer is loamy sand.

Permeability of the Cuddeback soil is moderately slow in the subsoil and very slow in the hardpan. Available water capacity is very low or low. Runoff is medium or rapid, and the hazard of water erosion is slight or

moderate. The hazard of soil blowing is slight where the surface is protected. Effective rooting depth is 20 to 40 inches.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion and soil blowing. Gullying and sediment deposition caused by channeling of excess runoff can occur during high intensity storms. Major forage species are filaree and fiddleneck.

This map unit is in capability subclass VIIe (30), nonirrigated.

152 Norob-Halloran complex, 0 to 5 percent slopes. This map unit is on terraces that have a microrelief of small depressional areas. Some areas are dissected by deep intermittent drainageways. The natural vegetation is mainly salt tolerant shrubs, grasses, and forbs. Elevation is 2,000 to 2,500 feet.

This unit is 60 percent Norob loamy sand and 20 percent Halloran sandy loam. The Norob soil is in the higher areas of terraces adjacent to playas. Slopes are broad, convex, and nearly level to undulating, and they range from 0 to 5 percent. The Halloran soil is in the lower areas of terraces or on side slopes near drainageways. Slopes are broad, slightly convex, and nearly level, and they range from 0 to 2 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Cajon loamy sand, loamy substratum, and Cajon sand on alluvial fans; soils that are similar to the Halloran soil but have a duripan below the subsoil and are on the lower margins of alluvial fans near small depressional areas that are similar to playas; and soils on terraces that are similar to the Norob soil but have a redder subsoil and a soft caliche layer. Also included are small areas of soils in shallow, rounded depressional areas that are similar to playas, and soils in slick spots that are 5 to 50 feet in diameter and have strata of contrasting sediment that ranges from clay loam to coarse sand. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Norob soil is very deep and well drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is light yellowish brown loamy sand about 5 inches thick. The subsoil is brown sandy clay loam and clay loam about 28 inches thick. The substratum is stratified pale brown loamy sand and fine sandy loam to a depth of 60 inches or more. The subsoil and substratum are moderately alkaline or strongly alkaline. The subsoil is slightly saline or moderately saline and is high in content of alkali. In some areas of similar included soils, the surface layer is sand.

Permeability of the Norob soil is slow. Available water capacity is moderate because of the content of salts and alkali. Runoff is slow, and the hazard of water erosion is slight. The soil is subject to ponding for short periods after brief heavy rainstorms. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

The Halloran soil is very deep and moderately well drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is very pale brown sand about 2 inches thick. The subsoil is reddish brown and reddish yellow sandy loam about 19 inches thick. The upper 12 inches of the substratum is yellow and brown loamy sand, and the lower part to a depth of 60 inches or more is yellow and yellowish brown, stratified sandy loam and loamy fine sand. The subsoil and substratum are moderately alkaline to very strongly alkaline. The subsoil is slightly saline to strongly saline and is very high in content of alkali.

Permeability of the Halloran soil is moderately slow. Available water capacity is very low or low because of the content of salts and alkali. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to ponding for short periods after heavy rains. The hazard of soil blowing is high.

This unit is used mainly as wildlife habitat. It is also used for grazing.

If this unit is used for grazing, the main limitations are low precipitation, the moderate to very high content of salts and alkali, and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive soil blowing. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are saltbush, filaree, and fiddleneck.

This map unit is in capability subclass VIIs (30), nonirrigated.

153 Peterman loam. This very deep, moderately well drained soil is on the lower margins of alluvial fans and on basin rims. It formed in fine-textured alluvium derived from mixed sources. Slope is 0 to 2 percent. Slopes are broad, smooth, slightly convex, and nearly level. Many areas are dissected by shallow intermittent drainageways. The natural vegetation is mainly salt tolerant shrubs, grasses, and forbs. Elevation is 2,800 to 3,000 feet.

Typically, the surface layer is pale brown loam about 16 inches thick. The underlying material to a depth of 60 inches or more is very pale brown clay that includes few to many white masses of soft lime and concretions of hard lime. The lime masses and concretions form a discontinuous caliche layer about 36 inches thick. The surface layer and underlying material are moderately

alkaline or very strongly alkaline and are moderately saline to strongly saline and strongly alkali. In some areas of similar included soils, the surface layer is clay loam.

Included in this unit are small areas of Bousic clay and Rosamond loam, saline-alkali, on the lower margins of fans and on basin rims. Also included are many slick spots.

Permeability of the Peterman soil is slow. Available water capacity is low because of the content of salts and alkali. It is moderate or high in reclaimed areas. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat. Small areas have been reclaimed and are used for irrigated crops such as alfalfa, small grain hay, and pasture. It is also used for grazing and homesite development.

This unit is suited to irrigated crops in areas where it has been reclaimed. In areas that have not been reclaimed, the unit is limited mainly by the moderate or high content of salts and alkali and the high content of lime. In reclaimed areas, estimated yields for the following crops are: alfalfa 6 to 8 tons, small grain hay 1.5 to 2.5 tons, and pasture 10 to 12 animal-unit-months.

Slow permeability of the subsoil and the problem of obtaining high quality water for leaching limit reclamation. The content of salts and alkali in the soil can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil. Generally, there is gypsum in this soil, which aids in the reclamation process. Subsoiling breaks up restrictive layers and allows water and salts to move out of the root zone. During reclamation, only highly salt tolerant plants should be grown. Grain, alfalfa, and pasture plants can be seeded simultaneously to aid in establishing new seedlings. Returning crop residue to the soil reduces surface crusting and increases water infiltration and organic matter content.

Border, furrow, and sprinkler irrigation systems are suited to this unit. Enough water must be applied to satisfy the needs of the crop and to leach the salts and alkali out of the root zone. In most areas the soil should be leveled and smoothed to obtain uniform distribution of water and to prevent salts from accumulating in the higher lying areas. Sprinkler systems should be designed so that the water is applied at a rate that does not exceed the water intake rate of the soil.

If this unit is used for homesite development, it is limited mainly by the moderate or high shrink-swell potential, low strength, slow permeability of the subsoil, high content of lime, and high content of salts and alkali. Buildings and roads should be designed to offset the effects of shrinking and swelling. The slow permeability of the subsoil limits use of this unit for septic tank absorption fields. Increasing the size of absorption fields helps to compensate for the slow permeability.

As much of the existing natural vegetation as feasible should be left around homesites. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind. Among the trees most suitable for use in windbreaks are Arizona cypress and Athel. The high content of salts, alkali, and lime should be considered in selecting landscaping plants. Properly fertilizing, mulching, and irrigating are essential for establishing and maintaining landscaping plants.

If this unit is used for grazing, the main limitations are low precipitation and the high content of salts and alkali. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial plant species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are shadscale, filaree, and brome.

This map unit is in capability unit IIIs-6 (30), irrigated, and in capability subclass VIIs (30), nonirrigated.

154 Peterman clay. This very deep, moderately well drained soil is on basin rims. It formed in fine-textured alluvium derived from mixed sources. Slope is 0 to 2 percent. Slopes are broad, smooth, slightly convex, and nearly level. Many areas are dissected by shallow intermittent drainageways. The natural vegetation is mainly salt tolerant shrubs, grasses, and forbs. Elevation is 2,850 to 2,900 feet.

Typically, the surface layer is very pale brown clay about 5 inches thick. The underlying material to a depth of 60 inches or more is pale brown or very pale brown clay that includes few to many white masses of soft lime and concretions of hard lime. The lime masses and concretions form a discontinuous caliche layer about 36 inches thick. The surface layer and underlying material are moderately alkaline to very strongly alkaline, moderately saline or strongly saline, and strongly alkali. In some areas of similar included soils, the surface layer is clay loam.

Included in this unit are small areas of Bousic clay and Lavic loamy fine sand on basin rims.

Permeability of the Peterman soil is slow. Available water capacity is very low or low because of the content of salts and alkali. It is moderate or high in reclaimed areas. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat. Small areas have been reclaimed and are used for irrigated crops such as alfalfa, small grain, hay, and pasture. It is also used for grazing.

This unit is suited to irrigated crops in areas where it has been reclaimed. In areas that have not been

reclaimed, it is limited mainly by the moderate or high content of salts and alkali and the high content of lime. In reclaimed areas estimated yields for the following crops are: alfalfa 5 to 7 tons, small grain hay 1.5 to 2.5 tones, and pasture 10 to 12 animal-unit-months.

The fine texture and slow permeability of the soil and the problem of obtaining high quality water for leaching limit reclamation. The content of salts and alkali can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil. Generally, there is gypsum in the soil, which aids in the reclamation process. Subsoiling breaks up restrictive layers and allows water and salts to move out of the root zone. During reclamation, only highly salt tolerant plants should be grown. In areas where the soil has been irrigated for a long time, the content of salts in the upper 24 to 30 inches has been lowered to a satisfactory level for common salt tolerant plants. Grain, alfalfa, and pasture plants can be seeded simultaneously to aid in establishing new seedlings. Returning crop residue to the soil reduces surface crusting and increases water infiltration.

Border, furrow, and sprinkler irrigation systems are suited to this soil. Before reclamation has been completed, however, the use of sprinklers on the soil in this unit is limited by the slow water intake rate, fine texture in the surface layer, and muddiness. Muddiness hinders the movement of sprinkler equipment. Enough water must be applied to satisfy the needs of the crop and to leach the salts and alkali out of the root zone. In most areas the unit should be leveled and smoothed to obtain uniform distribution of water and to prevent salts from accumulating in the higher lying areas. Sprinkler systems should be designed so that the water is applied at a rate that does not exceed the water intake rate of the soil.

If this unit is used for grazing, the main limitations are low precipitation and the moderate or high content of salts and alkali. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing permanent removal of many perennial plant species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Grazing when the soil is wet compacts the soil and reduces forage protection. Major forage species are shadscale, fiddleneck, and brome.

If this unit is used for homesite development, the main limitations are the hazard of flooding, high shrink-swell potential, low soil strength, slow permeability, and high content of salts, alkali, and lime. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Buildings and roads should be designed to offset the effects of shrinking and swelling.

The slow permeability of the subsoil limits use of this unit for septic tank absorption fields. Increasing the size of absorption fields helps to compensate for the slow permeability.

As much of the existing natural vegetation as feasible should be left around homesites. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind. Among the trees most suitable for use in windbreaks are Arizona cypress and Athel. The high content of salts, alkali, and lime should be considered in selecting landscaping plants. Properly fertilizing, mulching, and irrigating are essential for establishing and maintaining landscaping plants.

This map unit is in capability unit IVs-6 (30), irrigated, and in capability subclass VIIs (30), nonirrigated.

155 Pits. This map unit consists of gravel pits and rock quarries. Pits and quarries are open excavations from which the soil is removed and the underlying material or bedrock is extracted.

The gravel pits are mainly in areas on alluvial fans, flood plains, and river terraces along or near the Mojave River. They are in beds of very gravelly or very cobbly, stratified alluvium. Sand is also excavated in some areas along the Mojave River.

Rock quarries are on hills and mountains throughout the survey area. The principal kinds of rock and minerals mined are limestone, dolomite, marble, silica, and granite.

Included in this unit near gravel pits are small areas of Arizo gravelly loamy sand, Cajon gravelly sand, Yermo soils on fans, and Riverwash. Also included in the unit, near rock quarries, are small areas of Trigger soils on foothills, Sparkhule gravelly sandy loam on foothills, Rock outcrop on ridges and escarpments, and small areas of mine dumps.

This unit is highly varied in its characteristics and properties. It is essentially barren of vegetation and is subject to accelerated erosion.

This unit is used mainly as a source of construction material. It is also used as wildlife habitat.

This map unit is in capability subclass VIIIs (30), nonirrigated.

156 Playas. This map unit consists of very poorly drained areas on flats in closed basins. It is essentially barren of vegetation. Elevation is 1,750 to 3,100 feet.

Playas consists of stratified sediment that has accumulated as a result of surface runoff from the higher surrounding areas. The sediment is dominantly clay but ranges from silty clay to loamy sand. Areas of Playas are strongly saline-alkali. Salt commonly crusts on the surface (fig. 12).

Included in this unit are small areas of Bousic clay, Norob loamy sand, and Halloran sandy loam on the fringes of Playas and in slightly elevated areas of Playas.

Figure 12. Harper Lake, a typical playa, is barren of vegetation.

The surface layer of these soils has been removed by soil blowing.

Permeability is very slow. Runoff is very slow. During high intensity rains, these areas are flooded and become ponded for short periods until the water evaporates. The hazard of soil blowing is very high when the soil is dry.

This unit is used mainly for recreation and as wildlife habitat.

This map unit is in capability subclass VIIIs (30), nonirrigated.

157 Riverwash. This map unit consists of areas in the Mojave River bed and in beds of intermittent streams. It consists of areas of unstable sandy and gravelly alluvium that is frequently removed, resorted, and redeposited. Drainage is variable. The areas of Riverwash are essentially barren of vegetation. Elevation is 1,700 to 3,100 feet.

Riverwash is subject to flooding during prolonged storms of high intensity.

Included in this unit are small areas of Villa loamy sand and Victorville sandy loam on low stream terraces along the Mojave River. Also included are areas and strata of finer textured material.

This unit is used as wildlife habitat.

This map unit is in capability subclass VIIIw (30), nonirrigated.

158 Rock outcrop-Lithic Torriorthents complex, 15 to 50 percent slopes. This map unit is on mountains and hills. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 3,000 to 4,950 feet.

This unit is 60 percent Rock outcrop and 30 percent Lithic Torriorthents. Rock outcrop is on mountainsides, ridges, and rugged hills and generally dominates the landscape. Lithic Torriorthents are between the areas of Rock outcrop, in small depressional areas, and on relatively stable hillsides. Slopes are hilly or steep and range from 15 to 50 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Sparkhule gravelly sandy loam, Trigger gravelly sandy loam on hillsides, and soils, on the lower part of side slopes and

in stable areas between areas of Rock outcrop, that have a well developed sandy loam or sandy clay loam subsoil, are underlain by weathered granite, and include patchy clay films. Soil colors and depth to bedrock are varied. Also included are areas of soils that have a very weakly developed subsoil that is less than 10 inches thick. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Rock outcrop consists of exposed areas of granitic rock.

Lithic Torriorthents are very shallow and shallow and are well drained. They formed in material weathered from granitic rock. The surface layer and underlying material range from sandy loam to very gravelly sand. Depth to hard fractured granite is 1 inch to 18 inches. Clay coatings are evident on some surfaces of weathered granite. Color, texture, and depth vary from one area to another.

Permeability of the Lithic Torriorthents is very rapid to rapid. Runoff is medium or rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight. Effective rooting depth is 1 inch to 18 inches.

This unit is used mainly as wildlife habitat.

This map unit is in capability subclass VIIIs (30), nonirrigated.

159 Rosamond loam, saline-alkali. This very deep, well drained soil is on the lower margins of alluvial fans and on basin rims. It formed in alluvium derived dominantly from granitic material. Slope is 0 to 2 percent. Slopes are broad, smooth, and nearly level. The natural vegetation is mainly salt tolerant shrubs, grasses, and forbs. Elevation is 1,700 to 2,800 feet.

Typically, the surface layer is pale brown loam about 5 inches thick. The upper 39 inches of the underlying material is pale brown and light yellowish brown clay loam, and the lower part to a depth of 60 inches or more is pale brown loamy fine sand and very pale brown loamy sand. The soil is moderately saline-alkali. In some areas of similar included soils, the surface layer is sandy loam.

Included in this unit are small areas of Cajon sand and Kimberlina loamy fine sand on fans and Rosamond soils that are strongly saline, are high in content of alkali, and are on basin rims. Also included are small areas of soils that are overblown and have hummocks 2 to 3 feet high.

Permeability of this Rosamond soil is moderately slow to a depth of 40 inches and moderately rapid below this depth. Available water capacity is low or moderate because of the content of salts and alkali. It is high in reclaimed areas. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly as wildlife habitat and for grazing. It is also used for homesite development. Small areas have been reclaimed and are used for irrigated crops such as alfalfa, small grain hay, and pasture.

If this unit is used for grazing, the main limitations are low precipitation, the moderate content of salts and alkali, and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive soil blowing. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are filaree and brome.

If this unit is used for homesite development, the main limitations are the hazard of flooding, the shrink-swell potential, low strength, the moderately slow permeability, the moderate content of salts and alkali, and the hazards of sloughing and soil blowing. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Buildings and roads should be designed to offset the effects of shrinking and swelling. If used as a base for roads, the upper part of the soil can be mixed with the underlying loamy sand to increase its strength and stability.

The limitation of moderately slow permeability in the subsoil can be overcome by increasing the size of the septic absorption field or by increasing the depth of the trenches so that they reach below the restrictive layer. Because of the sandy texture of the substratum, unfiltered effluent can contaminate the ground water. Because of the sandy texture of the lower part of the substratum, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. The moderate content of salts and alkali should be considered in selecting landscaping plants. Properly fertilizing, mulching, and irrigating are essential for establishing and maintaining landscaping plants.

This unit is suited to irrigated crops following reclamation. It is limited mainly by the moderate content of salts and alkali and by the hazard of soil blowing. In reclaimed areas estimated yields for the crops grown are: alfalfa 5 to 7 tons, small grain hay 1.5 to 2.5 tons, and pasture 10 to 12 animal-unit-months. The content of salts and alkali can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil. Subsoiling breaks up restrictive layers and allows water and salts to move out of the root zone. During reclamation, only moderately salt tolerant plants should be grown. Grain can be seeded simultaneously

with alfalfa or pasture plants to aid in establishing new seedlings. Returning crop residue to the soil reduces surface crusting and increases water infiltration.

Border, furrow, or sprinkler irrigation systems are suited to this unit. Enough water must be applied to satisfy the needs of the crop and to leach the salts and alkali out of the root zone. In most areas the soil should be leveled and smoothed to obtain uniform distribution of water and to prevent salts from accumulating in the higher areas.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress and Athel.

This map unit is in capability unit IIIs-6 (30), irrigated, and in capability subclass VIIs (30), nonirrigated.

160 Rosamond loam, strongly saline-alkali. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slope is 0 to 2 percent. Slopes are broad, smooth, and nearly level. The natural vegetation is mainly salt tolerant shrubs, grasses, and forbs. Elevation is 1,950 to 2,000 feet.

Typically, the surface layer is brown loam about 8 inches thick. The upper 28 inches of the underlying material is pale brown loam, and the lower part to a depth of 60 inches or more is yellow and pale yellow, stratified loam to silty clay loam. This soil is strongly saline and strongly alkali throughout. In some areas of similar included soils, the surface layer is silty clay loam or sandy loam, and in some areas there is a thin, patchy, white crust of salt on the surface.

Included in this unit are small areas of soils that are similar to this Rosamond soil but have thin strata of gravelly material or silty clay between depths of 10 and 40 inches. Also included are small areas of Halloran sandy loam and Cajon sand, loamy substratum, on the lower margins of fans.

Permeability of this Rosamond soil is moderately slow. Available water capacity is low or moderate because of the content of salts and alkali. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This soil is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are low precipitation, the high content of salts and alkali, and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are filaree and brome.

This map unit is in capability subclass VIIs (30), nonirrigated.

161 Soboba gravelly sand, cool, 2 to 9 percent slopes. This very deep, excessively drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are long, smooth, and gently sloping or moderately sloping. Many areas are dissected by deep intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 4,000 to 4,200 feet.

Typically, the surface layer is grayish brown gravelly sand about 4 inches thick. The underlying material to a depth of about 60 inches or more is grayish brown very gravelly sand. The surface layer is slightly acid, and the soil ranges to neutral or mildly alkaline as depth increases.

Included in this unit are small areas of Tujunga sand and Hanford sandy loam on fans. Also included are small areas of soils that have cobbles and stones on the surface or have less than 35 percent gravel in the underlying material.

Permeability of this Soboba soil is very rapid. Available water capacity is very low. Runoff is very slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more. The soil is subject to occasional periods of very brief flooding.

This soil is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the main limitations are low precipitation and the slight or moderate hazard of water erosion. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Major forage species are desert needlegrass, red brome, and filaree.

If this unit is used for homesite development, it is limited by the hazard of flooding, the very rapid permeability, the content of pebbles and cobbles, the hazard of sloughing, and the very low available water capacity. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding.

Septic tank absorption fields function well; because of the very rapid permeability and the content of cobbles, however, unfiltered effluent can contaminate the ground water. Because of the sandy texture of the soil, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind. Among the trees most suitable for use in windbreaks are Arizona cypress and aleppo pine.

Establishment of landscaping plants is limited by the pebbles and cobbles in this soil. Proper fertilizing, mulching, and irrigation are essential for maintaining landscaping plants because the soil in this unit is droughty.

This map unit is in capability subclass VIIw (30), nonirrigated.

162 Sparkhule-Rock outcrop complex, 15 to 50 percent slopes. This map unit is on upland foothills. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,400 to 4,500 feet.

This unit is 60 percent Sparkhule gravelly sandy loam and 35 percent Rock outcrop. The Sparkhule soil is on hillsides between areas of Rock outcrop and on the stable lower part of side slopes. Slopes are hilly to steep and range from 15 to 50 percent. Rock outcrop is on hills and ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of soils that have a sandy loam to gravelly sandy clay loam subsoil underlain by weathered granite. Included areas make up about 5 percent of the total acreage. The percentage varies from one area to another.

The Sparkhule soil is shallow and well drained. It formed in material weathered from hard volcanic rock. Typically, the surface layer is very pale brown gravelly sandy loam about 2 inches thick. The subsoil is reddish yellow and strong brown gravelly sandy clay loam and reddish yellow sandy clay loam about 16 inches thick over hard volcanic rock. Depth to bedrock ranges from 14 to 20 inches.

Permeability of the Sparkhule soil is moderately slow. Available water capacity is very low or low. Runoff is medium or rapid, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is slight. Effective rooting depth is 14 to 20 inches.

Rock outcrop consists of exposed areas of volcanic rock.

This unit is used mainly as wildlife habitat. It is also used for grazing.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Natural terrain barriers associated with this unit should be used as livestock management area boundaries. Major forage species are desert needlegrass, filaree, and red brome.

This map unit is in capability subclass VIIe (30), nonirrigated.

163 Torriorthents-Torripsamments-Urban land complex, 0 to 9 percent slopes. This map unit is on alluvial fans and river terraces. The soils in this unit have been terraced or leveled by earthmoving equipment or have been covered by urban structures so that much of their original shape and many of their physical characteristics have been obscured or destroyed. Elevation is 2,400 to 2,450 feet.

This unit is 60 percent Torriorthents, 25 percent Torripsamments, and 15 percent Urban land. Slopes are nearly level to moderately sloping and range from 0 to 9 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Torriorthents are very deep and well drained. The texture is dominantly sandy loam to a depth of 60 inches or more, but thin to thick strata of sand, loamy sand, or sandy clay loam are common. Gravel content ranges from 0 to 20 percent.

Permeability of Torriorthents is moderately rapid to moderately slow. Runoff is slow or medium, and the hazards of water erosion and soil blowing are moderate or high.

Torripsamments are very deep and somewhat excessively drained. The texture dominantly is loamy sand to a depth of 60 inches or more, but it is sand in some pedons. Thin strata of sandy loam are common. Gravel content ranges from 0 to 20 percent.

Permeability of Torripsamments is rapid to moderately rapid . Runoff is slow or medium, and the hazards of water erosion and soil blowing are moderate or high.

Urban land consists of areas covered by streets, parking lots, homes, and other structures.

This unit is used for homesite development and urban uses. It is limited by the hazards of water erosion and soil blowing. Structures that divert and control runoff are needed in areas where buildings and roads are constructed. Revegetating disturbed areas around construction sites helps to control water erosion and soil blowing. Establishing and maintaining a plant cover can be achieved by properly fertilizing, mulching, and irrigating. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

This unit is not assigned a capability classification.

164 Trigger gravelly loam, 5 to 15 percent slopes. This shallow, well drained soil is on upland terraces. It formed in material weathered from hard, lime-cemented conglomerate. Slopes are long, broad, convex, and moderately sloping to rolling. Most areas are dissected by deep intermittent drainageways. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,100 to 3,800 feet.

Typically, the surface layer is brown gravelly loam about 12 inches thick over hard, lime-cemented conglomerate. In some areas of similar included soils, the surface layer is sandy loam. Depth to bedrock ranges from 10 to 18 inches.

Included in this unit are small areas of Yermo gravelly sandy loam on foothills. Also included are small areas of Trigger soils that have slopes of 15 to 20 percent and

soils that are similar to this Trigger soil but have slopes of less than 5 percent.

Permeability of this Trigger soil is moderately rapid. Available water capacity is very low. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. Effective rooting depth is 10 to 18 inches.

This unit is used mainly as wildlife habitat. It is also used for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of water erosion. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in barren areas and lower overall production. Major forage species are shadscale and common winterfat.

This map unit is in capability subclass VIIe (30), nonirrigated.

165 Trigger-Sparkhule-Rock outcrop association, steep. This map unit is on upland foothills. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,400 to 3, 200 feet.

This unit is 40 percent Trigger gravelly sandy loam, 30 percent Sparkhule gravelly sandy loam, and 30 percent Rock outcrop. The Trigger soil is on ridgetops and the upper part of side slopes. Slopes are steep and range from 30 to 40 percent. The Sparkhule soil is on the lower part of side slopes and on toe slopes. Slopes are hilly and range from 20 to 30 percent. Rock outcrop is on hills and ridges.

The Trigger soil is shallow and well drained. It formed in material weathered from hard sedimentary or metasedimentary rock. Typically, the surface layer is very pale brown gravelly sandy loam about 12 inches thick over hard, fractured sedimentary rock. Depth to bedrock ranges from 10 to 18 inches.

Permeability of the Trigger soil is moderately rapid. Available water capacity is very low. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. Effective rooting depth is 10 to 18 inches.

The Sparkhule soil is shallow and well drained. It formed in material weathered from hard volcanic rock. Typically, the surface layer is very pale brown gravelly sandy loam about 2 inches thick. The subsoil is reddish yellow and strong brown gravelly sandy clay loam and reddish yellow sandy clay loam about 16 inches thick over hard volcanic rock. Depth to bedrock ranges from 14 to 20 inches.

Permeability of the Sparkhule soil is moderately slow. Available water capacity is very low or low. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. Effective rooting depth is 14 to 20 inches.

Rock outcrop consists of exposed areas of sedimentary or metasedimentary rock.

This unit is used mainly as wildlife habitat. It is also used for grazing.

If this unit is used for grazing, the main limitation is low precipitation. The Trigger soil is also limited by the hazard of water erosion. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Major forage species are shadscale, common winterfat, and desert needlegrass.

Trigger and Sparkhule soils are in capability subclass VIIe (30), nonirrigated.

166 Trigger-Rock outcrop complex, 30 to 50 percent slopes. This map unit is on upland foothills. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 2,800 to 3,800 feet.

This unit is 60 percent Trigger gravelly sandy loam and 40 percent Rock outcrop. The Trigger soil is on side slopes and ridges of hills between areas of Rock outcrop.

The Trigger soil is shallow and well drained. It formed in material weathered from hard sedimentary or metasedimentary rock. Typically, the surface layer is very pale brown gravelly sandy loam about 12 inches thick over hard, fractured sedimentary rock. Depth to bedrock ranges from 10 to 18 inches.

Permeability of the Trigger soil is moderately rapid. Available water capacity is very low. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. Effective rooting depth is 10 to 18 inches.

Rock outcrop consists of exposed areas of sedimentary or metasedimentary rock.

This unit is used mainly as wildlife habitat.

This map unit is in capability subclass VIIIs (30), nonirrigated.

167 Tujunga sand, cool, 2 to 9 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are long, smooth, and gently sloping to moderately sloping. Many areas are dissected by deep intermittent drainageways. The natural vegetation is mainly juniper, desert shrubs, grasses, and forbs. Elevation is 3,900 to 4,200 feet.

Typically, the surface layer is light brownish gray sand about 3 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray, brown, and pale brown sand that has strata of brown gravelly sand between depths of 14 and 36 inches. The surface layer is slightly acid, and the underlying material is neutral or mildly alkaline.

Included in this unit are small areas of Soboba gravelly sand and Hanford sandy loam on fans. Also included are small areas of soils that have pebbles and cobbles on

the surface and soils that are similar to this Tujunga soil but are calcareous below a depth of 40 inches and are moderately alkaline throughout.

Permeability of this Tujunga soil is rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more. The soil is subject to occasional flooding for brief periods.

This soil is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the main limitation is the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion and soil blowing. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial plant species. Clearing in many cases has increased forage production by reducing competition from California juniper and Joshua-tree. Major forage species are desert needlegrass, bluegrass, and brome.

If this unit is used for homesite development, it is limited by the hazard of flooding, the rapid permeability, the hazard of sloughing, and the hazard of soil blowing. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Septic tank absorption fields function well; because of the rapid permeability, however, unfiltered effluent can contaminate the ground water. Because of the sandy texture, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress and aleppo pine. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability subclass VIIw (30), nonirrigated.

168 Typic Haplargids-Yermo complex, 8 to 30 percent slopes. This map unit is on hills dissected by numerous shallow to deeply incised intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 2,400 to 3,100 feet.

This unit is 55 percent Typic Haplargids and 30 percent Yermo gravelly sandy loam. Typic Haplargids are on toe slopes adjoining fans, on concave foot slopes adjacent to drainageways, and on ridges and crests of hills. Slopes are rolling and range from 8 to 15 percent. The Yermo soil is on the steeper parts of hills. Slopes are hilly and range from 15 to 30 percent. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Cajon soils in narrow valleys between ridges and Kimberlina soils on toe slopes adjacent to the narrow valleys. Also included are Nebona, Cuddeback, and Mirage soils on stable toe slopes of hills in areas adjacent to smoother, more uniform fans and terraces. Included areas make up about 15 percent of the total acreage.

Typic Haplargids are very deep, well drained soils. They formed in gravelly and cobbly alluvium derived from mixed sources. Typically, 70 to 90 percent of the surface is covered by a desert pavement of varnished gravel and cobbles, but in some areas as little as 40 percent of the surface is covered by gravel and cobbles that have little or no desert varnish. The surface layer is very pale brown gravelly sandy loam to gravelly sand about 1 inch to 6 inches thick. The subsoil is yellowish brown, brown, or reddish brown sandy loam to very gravelly sandy clay loam. The content of gravel and cobbles ranges from 5 to 45 percent. The thickness of the subsoil is highly varied. The substratum to a depth of 60 inches or more is gravelly sand to very gravelly loamy sand. The degree of variation in these soils is a result of erosion along the numerous intermittent drainageways that have cut and removed the original surface layer and some of the subsoil. The narrow stable areas between drainageways and on ridges have the most strongly developed desert pavement and soil horizons. The soil is not so well developed in areas nearer the eroding side slopes by the drainageways.

Permeability of Typic Haplargids is moderately rapid to moderately slow. Runoff is medium or rapid, and the hazard of water erosion is moderate or high. The hazard of soil blowing is slight or moderate. Effective rooting depth is 60 inches or more.

The Yermo soil is very deep and well drained. If formed in gravelly and cobbly alluvium derived from mixed sources. Typically, 40 percent of the surface is covered by pebbles and cobbles. The surface layer is pale brown gravelly sandy loam that is 10 percent cobbles. It is about 10 inches thick. The underlying material to a depth of 60 inches or more is very pale brown very gravelly sandy loam. In some areas of similar included soils, the surface layer is cobbly loamy sand or gravelly loamy sand.

Permeability of the Yermo soil is moderately rapid. Available water capacity is very low or low. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more.

This unit is used as wildlife habitat and for recreation. It is also used for homesite development.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion and soil blowing. Major forage species are desert needlegrass, red brome, and fiddleneck.

If this unit is used for homesite development, the main limitations are slope and the hazard of water erosion.

Typic Haplargids are also limited in some places by the shrink-swell potential, low strength, and the moderately slow permeability of the subsoil. Buildings and roads should be designed to offset the effects of shrinking and swelling. If used as a base for roads, the upper part of the soil can be mixed with coarser textured material to increase its strength and stability. The limitation of moderately slow permeability in the subsoil can be overcome by increasing the size of the septic tank absorption field. Steepness of slope is also a concern in installing absorption fields. Absorption lines should be installed on the contour.

The Yermo soil is also limited by cobbles and stones, which make it a poor filter for effluent from septic tanks. Slope is also a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

As much of the existing natural vegetation as feasible should be left around homesites. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind. Among the trees most suitable for use in windbreaks are Arizona cypress and Athel. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating. The content of cobbles and stones limits the establishment of landscaping plants on the Yermo soil.

This map unit is in capability subclass VIIe (30), nonirrigated.

169 Victorville sandy loam. This very deep, moderately well drained soil is on low river terraces and on flood plains along the Mojave River. It formed in alluvium derived dominantly from granitic material. Slope is 0 to 2 percent. Slopes are smooth, slightly convex, and nearly level. The natural vegetation is mainly scattered riparian trees, desert shrubs, grasses, and forbs. Elevation is 2,200 to 2,800 feet.

Typically, the surface layer is grayish brown sandy loam about 16 inches thick. The upper 19 inches of the underlying material is dark grayish brown sandy loam that has strata of loamy sand and gravelly sand, the next 14 inches is stratified gray loamy sand to very pale brown sand, and the lower part to a depth of 60 inches or more is dark grayish brown clay loam that has thin strata of loam and sandy loam. In some areas of similar included soils along old meander belts, the surface layer is clay loam.

Included in this unit are small areas of Villa loamy sand on flood plains. Also included are small areas of somewhat poorly drained to moderately well drained soils in the Mojave Narrows Regional Park, in the general vicinity of Middle Lake. These soils are sandy loam to clay loam throughout and have reddish brown and reddish yellow mottles between depths of 25 and 35 inches. In these soils there is a water table at a depth of about 45 to 60 inches.

Permeability of this Victorville soil is moderately rapid to a depth of 50 inches and moderately slow below this depth. In some areas permeability is moderately rapid throughout the profile. Available water capacity is moderate. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This unit is used mainly for irrigated crops such as alfalfa, small grain hay, and pasture. It is also used for homesite development, grazing, and wildlife habitat.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 6 to 8 tons, small grain hay 1.5 to 2.5 tons, and pasture 10 to 12 animal-unit-months. The unit is limited by the hazard of soil blowing and the moderate available water capacity.

Border, furrow, or sprinkler irrigation systems are suited to this unit. In most areas the soil should be leveled and smoothed to obtain uniform distribution of water. Sprinkler systems, if properly designed, insure better distribution of water. Because of the moderate available water capacity of the soil in this unit, irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

This unit is suited to homesite development. It is limited by the hazard of flooding, moderately slow permeability, hazard of sloughing, and hazard of soil blowing. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding.

The limitation of moderately slow permeability in the subsoil can be overcome by increasing the size of absorption fields. Because of the sandy texture of the soil, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive soil blowing. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are big saltbush, inland saltgrass, and brome.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

170 Victorville Variant sand. This very deep, well drained soil is on narrow lower margins of alluvial fans and in small basins. It formed in alluvium derived from mixed sources. Slopes are 0 to 2 percent. Slopes are long, narrow, and nearly level. Some areas are dissected by deep intermittent drainageways. The natural vegetation is mainly salt tolerant shrubs, grasses, and forbs. Elevation is 2,200 to 2,400 feet.

Typically, the surface layer is light yellowish brown sand about 5 inches thick. The upper 37 inches of the underlying material is stratified, pale brown and yellowish brown sand to sandy clay loam that has lenses of gravelly loamy coarse sand, and the lower part to a depth of 60 inches or more is light yellowish brown loamy fine sand. The substratum is moderately alkaline or strongly alkaline throughout and is moderately saline and strongly alkali to a depth of 40 inches. In some areas of similar included soils, the surface layer is loamy sand.

Included in this unit are small areas of Villa loamy sand on flood plains; Cajon sand and Cajon loamy sand, loamy substratum, on the lower margins of fans; and Dune land.

Permeability of this Victorville Variant soil is moderate. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight. Small areas become ponded for brief periods after short heavy rains. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding.

This soil is used as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are low precipitation, the moderate or high content of salts and alkali, and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive soil blowing. Major forage species are saltbush and Mediterranean schismus.

This map unit is in capability subclass VIIe (30), nonirrigated.

171 Villa loamy sand. This very deep, moderately well drained soil is on flood plains and on low river terraces along the Mojave River. It formed in alluvium derived dominantly from granitic material. Slope is 0 to 2 percent. Slopes are long, smooth, and nearly level. The natural vegetation is mainly scattered riparian trees, desert shrubs, grasses, and forbs. Elevation is 1,700 to 2,800 feet.

Typically, the surface layer is light brownish gray loamy sand about 7 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray, pale brown, and dark grayish brown loamy sand and light brownish gray loamy fine sand that has thin strata of dark brown sandy loam. In some areas of similar included soils, the surface layer is sand.

Included in this unit are small areas of Victorville sandy loam on low river terraces and Villa loamy sand, hummocky, on flood plains. Also included are small areas of soils that have pebbles on the surface and soils that are similar to this Villa soil but are sandy throughout and do not have strata of fine-textured material. In some areas the soils have mottles at a depth of 15 to 20 inches.

Permeability of this Villa soil is moderately rapid. Available water capacity is low or moderate. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding. A seasonal high water table is at a depth of 3 to 6 feet from December to April. In some areas adjacent to streams, the water table has been lowered to a depth of more than 6 feet by the increased pumping of irrigation water.

This unit is used mainly for irrigated crops such as alfalfa, small grain hay, and pasture. It is also used for homesite development, as wildlife habitat, and for grazing.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 5 to 7 tons, small grain hay 1 to 2 tons, and pasture 8 to 10 animal-unit-months. The unit is limited by the hazard of soil blowing, the high water intake rate, the low or moderate available water capacity, and low fertility. Sprinkler irrigation is better suited to this unit than most other methods because of the high water intake rate and low or moderate available water capacity. Sprinkler systems, if properly designed, insure better distribution of water on this sandy soil. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing. Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for homesite development, it is limited by the hazard of flooding, the depth to the seasonal high water table, the hazard of soil blowing, and the hazard of sloughing. Dikes and diversions that have outlets designed to bypass floodwater can be used to protect buildings from flooding. During winter, onsite sewage disposal systems fail and can contaminate the ground water because of the seasonal high water table. Because of the sandy texture of the soil, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are saltbush, inland saltgrass, and brome.

This map unit is in capability unit IIIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

172 Villa loamy sand, hummocky. This very deep, moderately well drained soil is on flood plains and low river terraces along the Mojave River. It formed in alluvium derived dominantly from granitic material. Slope is 0 to 2 percent. Slopes are irregular, narrow, and smooth. Hummocks about 2 to 3 feet high cover 50 to 90 percent of the area and form an intricate pattern. The natural vegetation is mainly scattered riparian trees, desert shrubs, grasses, and forbs. Elevation is 2,000 to 2,300 feet.

Typically, the surface layer is light brownish gray loamy sand about 7 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray loamy sand and loamy fine sand and thin strata of dark brown sandy loam.

Included in this unit are small areas of Victorville sandy loam on low river terraces, Villa loamy sand on low river terraces and flood plains, and Dune land.

Permeability of this Villa soil is moderately rapid. Available water capacity is low or moderate. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more. The soil is subject to rare periods of flooding. A seasonal high water table is at a depth of 3 to 6 feet from December to April.

This unit is used mainly as wildlife habitat. It is also used for irrigated crops, mainly alfalfa, pasture, and small grain hay, grazing, and homesite development.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 5 to 7 tons, small grain hay 1 to 2 tons, and pasture 8 to 10 animal-unit-months. The unit is limited by the hazard of soil blowing, the high water intake rate, the low or moderate available water capacity, the hummocky surface, and low fertility.

If this unit is used for irrigated crops, the soil needs to be leveled and smoothed to obtain uniform distribution of water. Sprinkler irrigation is better suited to this unit than most other methods because of the high water intake rate and low or moderate available water capacity. Sprinkler systems, if properly designed, insure better distribution of water. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain, alfalfa, and pasture plants can be seeded simultaneously to protect seedlings from soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Areas of this unit have been cleared for cultivation, causing a permanent removal of many perennial species. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are big saltbush and inland saltgrass.

If this unit is used for homesite development, it is limited by the hazard of flooding, the depth to a seasonal high water table, the hazard of soil blowing, and the hazard of sloughing. Protection from flooding should be considered. Dikes and diversions that have outlets to bypass floodwater can be used to protect buildings. During winter, onsite sewage disposal systems fail and

can contaminate the ground water because of the seasonal high water table. Because of the sandy texture, cutbanks are not stable and are subject to sloughing. Shoring can be used to prevent trenches from caving in.

As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability unit IIIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

173 Wasco sandy loam, cool, 0 to 2 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are broad, smooth, and nearly level. Many areas are dissected by intermittent drainageways. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 3,100 to 3,400 feet.

Typically, the surface layer is light yellowish brown sandy loam about 7 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown and brownish yellow sandy loam. The soil is noncalcareous and neutral to a depth of 40 inches. Reaction is mildly alkaline below this depth. In some areas of similar included soils, the surface layer is loamy sand.

Included in this unit are small areas of Cajon sand on fans and Lucerne sandy loam and Bryman loamy fine sand on old fans. Also included are small areas of soils that are similar to this Wasco soil but have strong brown and reddish yellow underlying material or a sandy clay loam buried subsoil at a depth of more than 40 inches.

Permeability of this Wasco soil is moderately rapid. Available water capacity is low or moderate. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing. It is also used for irrigated crops, mainly alfalfa, small grain hay, and pasture, and for homesite development.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are saltbush, filaree, and red brome.

This unit is suited to irrigated crops. Estimated annual yields per acre of the crops grown are: alfalfa 6 to 8 tons, small grain hay 1.5 to 2.5 tons, and pasture 10 to 12 animal-unit-months. The unit is limited by the hazard of soil blowing, the low or moderate available water capacity, and low fertility.

Border, furrow , and sprinkler irrigation systems are suited to this unit. In most areas the soil should be leveled and smoothed to obtain uniform distribution of water. Sprinkler systems, if properly designed, insure better distribution of water. Irrigation water should be properly managed. Light, frequent applications of water are needed to meet the needs of the crop and to conserve water.

Returning crop residue to the soil and leaving stubble on the surface reduce soil blowing and increase the organic matter content. Alfalfa seedlings can be protected by seeding the alfalfa in the fall in standing grain or sudangrass stubble. Grain can be seeded simultaneously with alfalfa or pasture plants to protect seedlings from soil blowing.

Planting windbreaks around fields also reduces soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress, aleppo pine, and Athel.

If this unit is used for homesite development, it is limited by the hazard of soil blowing. As much of the existing natural vegetation as feasible should be left around homesites to reduce soil blowing. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

This map unit is in capability unit IIe-1 (30), irrigated, and in capability subclass VIIe (30), nonirrigated.

174 Wasco sandy loam, cool, 2 to 5 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic material. Slopes are broad, smooth, slightly convex, and gently sloping. Most areas are dissected by deep intermittent drainageways. Natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 3,400 to 3,700 feet.

Typically, the surface layer is light yellowish brown sandy loam about 7 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown and pale brown sandy loam. The soil is noncalcareous and neutral to a depth of 40 inches. Reaction is mildly alkaline below this depth. In some areas of similar included soils, the surface layer is loamy sand.

Included in this unit are small areas of Cajon sand on fans and Lucerne sandy loam on old fans.

Permeability of this Wasco soil is moderately rapid. Available water capacity is low or moderate. Runoff is slow or medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing.

If this unit is used for grazing, the main limitations are low precipitation and the hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are saltbush, filaree, and red brome.

This map unit is in capability unit VIIe-1 (30), nonirrigated.

175 Wrightwood-Bull Trail association, sloping. This map unit is on terrace remnants. The natural vegetation is mainly desert shrubs, grasses, and forbs. Elevation is 3,900 to 4,300 feet.

This unit is 60 percent Wrightwood loamy sand and 25 percent Bull Trail sandy loam. The Wrightwood soil is on the more uniform parts of terrace remnants. Slopes are long, smooth, and narrow and range from 2 to 9 percent. The Bull Trail soil is on ridges, toe slopes, and side slopes of terrace remnants that are incised by intermittent stream channels. Slopes are strongly sloping or moderately steep and range from 10 to 20 percent in most areas.

Included in this unit are small areas of Gullied land and Haploxeralfs on hillsides and in deeply incised drainageways. Also included are small areas of Avawatz sandy loam, Hanford sandy loam, and Tujunga sand on narrow alluvial bottoms. Included areas make up about 15 percent of the total acreage.

The Wrightwood soil is very deep and well drained. It formed in old alluvium derived dominantly from granitic material. Typically, the surface layer is brown loamy sand about 3 inches thick. The subsoil is brown sandy loam about 43 inches thick. Below this to a depth of 60 inches or more is a buried subsoil of brown gravelly sandy loam. In some areas of similar included soils, the surface layer is sandy loam.

Permeability of the Wrightwood soil is moderately rapid in the surface layer and is moderate in the subsoil. Available water capacity is low or moderate. Runoff is medium, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is high. Effective rooting depth is 60 inches or more.

The Bull Trail soil is very deep and well drained. It formed in alluvium derived dominantly from granitic material. Typically, the surface layer is brown sandy loam about 4 inches thick. The upper 15 inches of the subsoil is yellowish red sandy clay loam, and the lower part to a depth of 60 inches or more is reddish yellow sandy loam. In some areas of similar included soils, the surface layer is loamy sand.

Permeability of this Bull Trail soil is moderately slow. Available water capacity is moderate or high. Runoff is medium, and the hazard of water erosion is moderate or high. The hazard of soil blowing is moderate. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat and for grazing. It is also used for homesite development.

If this unit is used for grazing, the Wrightwood soil is limited by the hazard of soil blowing and the slight or moderate hazard of water erosion. The Bull Trail soil is limited by the moderate or high hazard of water erosion and the moderate hazard of soil blowing. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion and soil blowing. Brush management that includes properly designed firebreaks, livestock trails, and access roads is necessary to limit wildfires and soil erosion. Clearing in some cases has increased forage production by reducing the competition from scrub live oak. Clearing, or any other disturbance that destroys the soil structure and vegetation, can result in increased soil blowing, barren areas, and lower overall production. Major forage species are desert needlegrass, squirreltail, and scrub live oak.

If the Wrightwood soil is used for homesite development, the main limitations are the moderate permeability of the subsoil and the hazards of soil blowing and water erosion. The limitation of moderate permeability can be overcome by increasing the size of the septic tank absorption field.

If the Bull Trail soil is used for homesite development, the main limitations are the moderate shrink-swell potential, low strength, the moderately slow permeability of the subsoil, the hazards of water erosion and soil blowing, and slope. Buildings and roads should be designed to offset the effects of shrinking and swelling. If used as a base for roads, the upper part of the soil can be mixed with sandy material to increase its strength and stability. The limitation of moderately slow permeability in the subsoil can be overcome by increasing the size of the septic tank absorption field. Steepness of slope is also a concern in installing septic fields. Absorption lines should be installed on the contour.

As much of the existing natural vegetation as feasible should be left around homesites on both the Wrightwood and Bull Trail soils to reduce soil blowing and water erosion. Protective measures such as mulching or seeding are needed to reduce water erosion on construction sites during winter. Areas disturbed during construction should be revegetated as soon as feasible. Windbreaks can be used to provide protection from the wind and reduce soil blowing. Among the trees most suitable for use in windbreaks are Arizona cypress and aleppo pine. Establishing and maintaining landscaping plants can be achieved by properly fertilizing, mulching, and irrigating.

The Wrightwood soil is in capability subclass VIIe (30), nonirrigated, and the Bull Trail soil is in capability subclass VIIe (20), nonirrigated.

176 Yermo gravelly sandy loam, 30 to 50 percent slopes. This very deep, well drained soil is on hills. It formed in gravelly and cobbly alluvium derived from mixed sources. Slopes are steep and convex. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 3,000 to 4,100 feet.

Typically, the surface layer is capped in most areas by a thick, fairly hard layer of gray, calcareous dust about 1/2 inch thick that was released into the air by the nearby cement plants. The surface layer is pale brown gravelly sandy loam about 10 inches thick. The upper 15 inches of the underlying material is very pale brown gravelly sandy loam that is 5 percent cobbles, and the lower part to a depth of 60 inches or more is very pale brown very gravelly sandy loam that is 5 percent cobbles.

Included in this unit are small areas of Trigger soils on foothills. Also included are small areas of Joshua loam on ridgetops and terrace remnants and Rock outcrop on ridges.

Permeability of this Yermo soil is moderately rapid. Available water capacity is low. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more.

This soil is used mainly as wildlife habitat and as a source of gravel. It is also used for grazing.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Major forage species are desert needlegrass, brome, and filaree.

This map unit is in capability subclass VIIe (30), nonirrigated.

177 Yermo-Kimberlina, cool, association, sloping. This map unit is on broad, smooth alluvial fans or hills. Some areas are dissected by numerous very deep intermittent drainageways. The natural vegetation is mainly yucca, desert shrubs, grasses, and forbs. Elevation is 2,900 to 4,100 feet.

This unit is 60 percent Yermo cobbly sandy loam and 30 percent Kimberlina gravelly sandy loam. The Yermo soil is on the broad middle portions of alluvial fans. Slopes are convex and range from 5 to 15 percent. The Kimberlina soil is on margins of fans adjacent to the drainageways. Slopes are concave and range from 2 to 9 percent. Near Daggett Ridge, the Yermo soil is on hills dissected by numerous deep drainageways. Slopes are hilly and range from 15 to 30 percent. The Kimberlina soil is on toe slopes near the drainageways. Slopes are gently sloping or moderately sloping and range from 2 to 9 percent.

Included in this unit are small areas of Arizo gravelly loamy sand and Cajon gravelly sand on narrow alluvial fans between hills and Nebona, Cuddeback, and Mirage soils on the stable lower margins of fans and on toe slopes of hills adjacent to nearly level, smoother, and more uniform terraces. Also included are soils that are similar to the Yermo soil but have weakly to strongly cemented caliche layers; soils that have stones and boulders on the surface; and about 1,800 acres of Torriorthents near Daggett Ridge that formed in nonmarine stratified sediment and sedimentary rock and have been folded, faulted, and deeply dissected (fig. 13). Slopes of Torriorthents are hilly to very steep and range from 15 to 75 percent, and the texture ranges from loamy sand to clay loam. Color and depth are also highly variable. Small areas of Badland are also included. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

The Yermo soil is very deep and well drained. It formed in gravelly and cobbly alluvium derived from mixed sources. Typically, 30 to 50 percent of the surface is covered by pebbles and cobbles. The surface layer is pale brown cobbly sandy loam about 10 inches thick. The upper 15 inches of the underlying material is very pale brown gravelly sandy loam that is 5 percent cobbles, and the lower part to a depth of 60 inches or more is light gray very gravelly sandy loam that is 15 percent cobbles. In some areas of similar included soils, the surface layer is cobbly loamy sand or gravelly loamy sand.

Permeability of the Yermo soil is moderately rapid. Available water capacity is low. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more.

The Kimberlina soil is very deep and well drained. It formed in gravelly alluvium derived from mixed sources. Typically, 30 to 50 percent of the surface layer is covered by pebbles and cobbles. The surface layer is pale brown gravelly sandy loam about 10 inches thick. The underlying material to a depth of 60 inches or more is very pale brown gravelly sandy loam.

Permeability of the Kimberlina soil is moderately rapid. Available water capacity is moderate. Runoff is medium, and the hazard of water erosion is slight or moderate. The hazard of soil blowing is slight. Effective rooting depth is 60 inches or more.

This unit is used mainly as wildlife habitat. It is also used for grazing.

If this unit is used for grazing, the main limitation is low precipitation. Grazing is limited to a few weeks in spring when plant growth is at its peak. Grazing should be managed to protect the unit from excessive water erosion. Cobbles, stones, and large pebbles on the surface often limit animal and vehicular traffic. Major forage species are desert needlegrass, galleta, and red brome.

The Yermo and Kimberlina soils are in capability subclass VIIe (30), nonirrigated.

Figure 13. Torriorthents in an area of Yermo-Kimberlina, cool, association, sloping.

Prime Farmland

In this section, prime farmland is defined and discussed and the prime farmland soils in the Mojave River Area are listed.

Prime farmland is of major importance in meeting the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. Adequate moisture and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils either are used for producing food or fiber or are available for these uses. Urban or built-up land and water areas cannot be considered prime farmland.

Prime farmland soils commonly get an adequate and dependable supply of moisture from precipitation or irrigation. Temperature and growing season are favorable, and level of acidity or alkalinity is acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not flooded during the growing season. The slope ranges mainly from 0 to 6 percent.

Soils that have a high water table, are subject to flooding, or are droughty may qualify as prime farmland soils if the limitations are overcome by drainage, flood control, or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

About 311,000 acres, or nearly 26 percent of the survey area, meets the requirements for prime farmland.

The following map units, when irrigated, meet the soil requirements for prime farmland. On some soils included in the list, measures are needed to overcome a hazard or limitation, such as flooding, wetness, or droughtiness. The location of each map unit is shown on the detailed soil maps provided with this publication. Soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

102 Avawatz-Oak Glen association, gently sloping
105 Bryman loamy fine sand, 0 to 2 percent slopes
106 Bryman loamy fine sand, 2 to 5 percent slopes
107 Bryman loamy fine sand, 5 to 9 percent slopes (where slopes are less than 7 percent)
109 Bryman sandy clay loam, 0 to 2 percent slopes
117 Cajon loamy sand, loamy substratum, 0 to 2 percent slopes
129 Hanford sandy loam, cool, 2 to 9 percent slopes (where slopes are less than 6 percent)
131 Helendale loamy sand, 0 to 2 percent slopes
132 Helendale loamy sand, 2 to 5 percent slopes
133 Helendale-Bryman loamy sands, 2 to 5 percent slopes
134 Hesperia loamy fine sand, 2 to 5 percent slopes
137 Kimberlina loamy fine sand, cool, 0 to 2 percent slopes
138 Kimberlina loamy fine sand, cool, 2 to 5 percent slopes
139 Kimberlina gravelly sandy loam, cool, 2 to 5 percent slopes
142 Lucerne sandy loam, 0 to 2 percent slopes
143 Lucerne sandy loam, 2 to 5 percent slopes
169 Victorville sandy loam
171 Villa loamy sand
172 Villa loamy sand, hummocky
173 Wasco sandy loam, cool, 0 to 2 percent slopes
174 Wasco sandy loam, cool, 2 to 5 percent slopes

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, road fill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Harlan D. McIntire, district conservationist, and Clarence U. Finch, area agronomist, Soil Conservation Service, helped to prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; a system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are discussed.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

If the soils in this survey area are used as cropland, the major concerns in management are maintaining or improving productivity, controlling erosion, and conserving water. Suitable management practices include using a conservation cropping system, maintaining crop residue on the surface, planting cover crops, using proper tillage methods, and reducing the toxic salt content of the soil. Irrigation systems should have an appropriate design, and the irrigation water should be applied according to the needs of the crop. The suitability of each map unit for crops is given in the section "Detailed Soil Map Units."

In this survey area irrigation is needed for almost all crops. Fruit and nut crops, such as apples, pears, apricots, peaches, and pistachio nuts, are grown only on the alluvial fans at the base of the San Bernardino and San Gabriel Mountains, where air drainage is good. These crops are adapted to deep, well drained soils such as the Hanford soils. Field crops are the major crops grown in the survey area. Alfalfa, barley, and oats are commonly grown, and to a lesser extent, onions, potatoes, corn, carrots, and squash are grown.

Soil blowing is a major hazard in this survey area. Soils that have a coarse-textured surface layer, such as Bryman, Cajon, Halloran, and Kimberlina soils, are especially susceptible to soil blowing. Practices that reduce soil blowing include leaving crop residue or stubble on the soil, maintaining a cover crop, using conservation tillage, and planting nurse crops and windbreaks. Young plants are more likely to be damaged by soil blowing than mature plants; therefore, planting in fall, when the velocity of the wind generally is lower, is a good practice.

Water erosion is also a hazard in this survey area. Water erosion can be reduced by planting cover crops, maintaining crop residue on the surface of the soil, and using proper tillage. Dikes and diversions can also be used to reduce water erosion.

Irrigation systems commonly used include furrow, border, sprinkler, and drip systems. The soils and topography should be considered when designing an irrigation system. A properly designed system distributes water evenly and minimizes the loss of water. Furrow and border systems are suited to soils that have a slope of less than 1 percent and have a moderate- or fine-textured surface layer, such as Bousic and Peterman soils. Sprinkler and drip systems are suited to most of the soils in the survey area. On soils that have a coarse-textured surface layer, sprinkler and drip systems distribute the water more evenly and promote more efficient use of water than other systems. Drip irrigation is well suited to use for orchards, windbreaks, landscape plantings, and gardens.

Salinity and the content of sodium are limitations of some of the soils in this survey area. The soils in this area that contain excess sodium are designated "alkali soils." Bousic, Glendale Variant, Halloran, and Peterman soils are affected by salts and alkali. Good quality irrigation water and adequate subsurface drainage are needed in order to successfully leach salts from the root zone. Tilling the soils deeply helps to increase the movement of water through the soils. Soil amendments such as gypsum and sulfur may be needed in combination with leaching to remove the sodium.

Pasture management should include proper irrigation, rotation grazing, fertilization, proper grazing use, and clipping. These practices help to maintain or improve the condition of the pasture.

Selecting a mixture of adapted plants is important when establishing a pasture. A mixture of orchardgrass or tall fescue and birdsfoot trefoil is suited to most soils in the survey area. Bermudagrass is suited to the moderately saline-alkali soils.

Clipping pasture grasses helps to maintain uniform growth. Orchardgrass and tall fescue should be at least 8 to 10 inches high before they are grazed. Grazing should be deferred when the height of the plants has been reduced to 3 or 4 inches. Bermudagrass should be at least 6 inches high before it is grazed. Grazing should be deferred when the height of the bermudagrass has been reduced to 2 or 3 inches. Some of the soils used for pasture in this survey area are Bousic, Bryman, Cajon, Peterman, Victorville, and Villa soils.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are given in the section "Detailed Soil Map Units." In any given year, yields may be higher or lower than those indicated because of variations in rainfall and other climatic factors. Yields for irrigated pasture are expressed in "animal-unit-months" (AUM's). An AUM is the amount of forage required by a mature cow and a calf in 1 month.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

Crops other than those shown in the map units are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive land forming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or*c,* to the class numeral, for example, IIe. The letter*e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Grouping soils into capability units is a convenient way to indicate management considerations. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIIs-3 or IVe-5. The numbers used to designate units within the subclasses are as follows:

0. Indicates limitations caused by stony, cobbly, or gravelly material in the substratum.
1. Indicates limitations caused by slope or by an actual or potential erosion hazard.
2. Indicates a limitation of wetness caused by poor drainage or flooding.
3. Indicates a limitation of slow or very slow permeability of the subsoil or substratum is caused by a clayey subsoil or by a substratum that is semiconsolidated.
4. Indicates a low available water capacity in sandy or gravelly soils.
5. Indicates limitations caused by a fine-textured or very fine-textured surface layer.
6. Indicates limitations caused by salts or alkali.
7. Indicates limitations caused by rocks, stones, or cobblestones.
8. Indicates that the soil has a very low or low available water capacity because the root zone generally is less than 40 inches deep over massive bedrock.
9. Indicates limitations caused by low or very low fertility, acidity, or toxicity that cannot be corrected by adding normal amounts of fertilizer, lime, or other amendments.

No unit designations are shown for class I soils because soil characteristics are similar for all soils in the class. Unit designations are not given for soils in classes V through VIII because these soils normally are not intensively managed as cropland.

Capability groupings are given in the description of each map unit in the section "Detailed Soil Map Units."

Major Land Resource Areas

In the Mojave River Area of San Bernardino County, capability classification is expanded by designating a land resource area. A land resource area is a broad geographic area that has a unique combination of climate, topography, vegetation, and land use. The Mojave River Area includes parts of two of these areas: the Southern California Mountains (20) and the Sonoran Basin and Range (30). At the end of each map unit description in the section "Detailed Soil Map Units," the number of the resource area is added in parentheses after the capability unit or subclass designation.

A soil in one resource area may have characteristics similar to those of a soil in another resource area and may be in the same capability unit or subclass, but the climate, vegetation, suitable crops, and recommended management practices may differ. For example, capability subclass VIIe indicates moderately deep or shallow, well drained soils. The soils in VIIe (20) are in the Southern California Mountains; if they are used for livestock grazing, they are managed to reduce the overstory competition. Those in capability subclass VIIe (30) are in the Sonoran Basin and Range; they receive only a small amount of precipitation, which does not support California juniper.

Land Resource Area 20 is on the southern edge of the survey area. It consists of the mountains, valleys, alluvial fans, and foothills of the San Bernardino and San Gabriel Mountains. The natural vegetation is mainly brush and an understory of perennial and annual grasses. Elevation ranges from 3,400 to 6,200 feet.

The average annual precipitation ranges from 16 to 25 inches, but on some alluvial fans at the base of the mountains it ranges from 9 to 16 inches. The average annual temperature ranges from 52 to 60 degrees F, and the average frost-free season ranges from 150 to 190 days. The frost-free season is slightly longer in areas

affected by the air-drained thermal belt at the base of the mountains.

Within the survey area, most of the land in this resource area is used as wildlife habitat and, in some areas, for grazing. At the lower elevations, scattered homesites are being developed. There are only small areas of cropland in this area. Most cropland is irrigated, although some areas had been used to grow nonirrigated grain. Water used for irrigation is taken from wells. The main crops are alfalfa and irrigated pasture.

About one-third of the part of this land resource area that is in the Mojave River Area is administered by the Federal government.

Land Resource Area 30 comprises over 90 percent of the survey area, including the Mojave Desert. It consists of alluvial fans, basins, and mountains and the flood plain of the Mojave River. The natural vegetation is mainly desert shrubs, yucca, short grasses, and scattered Joshua-tree. Elevation ranges from 1,700 to 4,500 feet.

The average annual precipitation ranges from 4 to 6 inches, but it is 6 to 9 inches along the southern edge of the resource area. The average annual temperature ranges from 60 to 65 degrees F, and the average frost-free season ranges from 190 to 250 days.

Within the survey area, most of the land in this resource area is used as wildlife habitat and for recreation. Small areas where high quality ground water is available for irrigation are used as cropland. These areas are along the Mojave River and in Apple Valley, Lucerne Valley, Mojave Valley, the Harper Lake area, and Mirage Lake area. The main crops are alfalfa, small grain hay, and irrigated pasture. Water for urban use and irrigation is taken from wells that tap the ground water basins of the Mojave River and other isolated basins in the survey area. Ground water recharge along the Mojave River is aided by the Mojave River Dam, which is 14 miles upstream from Victorville (*33*).

Homesite development is expanding rapidly in the Victorville, Apple Valley, and Hesperia areas. Scattered areas are used for grazing, mainly for sheep, during a few weeks in spring when plant growth is at its peak.

About one-fourth of this resource area is public land that is administered by the Bureau of Land Management. Also, there are three military installations in this part of the survey area.

Rangeland

Dick R. McCleery, range conservationist, Soil Conservation Service, helped to prepare this section.

This survey area is almost entirely rangeland. The small amount and erratic pattern of precipitation contribute to the variability of forage production in the area and limit the water available to livestock. This land is used mainly as wildlife habitat. Livestock grazing is secondary, and it is seasonal in response to forage production.

Initially, cattle were the dominant grazing livestock in the area. The importance of cattle has been declining, however, and sheep have become dominant. Decreases in the number of cattle correspond to increases in the number of sheep, in public recreational use, and in homesite development. Economics favoring the transportation of sheep have contributed to their increase.

Grazing is limited to a few weeks in spring except in years of above average rainfall. Grazing is heaviest in areas along the Mojave River and on the northern slopes of the San Gabriel and San Bernardino Mountains, where water is available from natural sources. If other areas are used for grazing, water for the animals must be transported by truck.

Livestock owners generally lease grazing rights on both public and privately controlled lands. When the available rangeland forage is gone, livestock graze in areas outside the survey area or in areas of improved irrigated pasture.

Climate and the kind of soil strongly influence the kind of natural vegetation in an area. In the upland positions along the southern boundary of the survey area, juniper grades into a mixture of singleleaf pinyon, shrubs, and yucca. Most of the forage, mainly perennial grasses and browse, is in this area.

The alluvial fans at the base of the uplands are in a precipitation zone that is transitional between the uplands and desert. At the upper end of the fans, where precipitation is highest, the vegetation is mainly juniper, yucca, and perennial grasses (fig. 14). At the lower end of the fans, the juniper is replaced by creosotebush and the annual plants tend to be higher producers of forage than the perennial grasses.

The soils on uplands and fans generally are moderately coarse textured, and the soils of the desert tend to be coarse textured or moderately coarse textured. Soil texture affects forage production indirectly by its effect on the available water capacity and water intake rate of the soil. The more finely textured soils have a higher available water capacity, but their water intake rate is slower.

The dominant plant on the desert is creosotebush. Soils on the older terraces in the central part of the survey area have developed barren areas of desert pavement. Also common in the central part are rock and gravel slopes of desert buttes and mountains.

Coarse-textured soils high in content of salts are in the northeastern and northwestern extremes of the survey area. These areas are dominated by saltbush because the soil is too saline or alkali for creosotebush. The fine-textured soils in these areas generally are also highly saline-alkali and are associated with barren playas or dry lakes.

Figure 14. California juniper is part of the vegetation on many soils along the southern edge of the survey area where the rainfall is more than 8 inches.

An area of riparian vegetation, including willows, cottonwoods, and honey mesquite, extends the length of the survey area in a narrow belt along the Mojave River.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 5 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in table 5 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal water table are also important.

In table 5, each range site has a distinctive name that includes the major land resource area and subarea in parentheses. An example is Coarse Loamy (20e). The subareas *e*, *f*, and *g* indicate different values of actual

evapotranspiration calculated for the entire year. The value is designated 4ETa and is calculated for an available water capacity of 4 inches. This value includes limitations imposed by rainfall, soil-moisture storage, and evapotranspiration. It is useful for comparing the suitability of climates for natural forage production. In this survey area, subarea *e* has a 4ETa range of 9 to 12 inches; subarea *f* has a range of 6 to 9 inches; and subarea *g* has a range of 3 to 6 inches. Suitability for forage production decreases as the 4ETa value decreases. The major land resource areas are described in the section "Major Land Resource Areas." More information about range sites can be obtained from local offices of the Soil Conservation Service.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation, the grasses, forbs, and shrubs that make up most of the plant community on each soil, is listed by common name. Under *composition,* the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present composition of the range vegetation.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a plant community somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Range Management Concerns

In the Mojave River Area, the principal forage producers are annual plants except in areas at the higher elevations, where forage producers are dominantly perennial grasses. The annuals in the survey area are short-lived and have only a brief period of palatability while they are green and growing. They have shallow root systems and can stay green only while the root zone contains available water. Growth begins with the arrival of winter rains and is slow during winter while the temperatures are cool. Growth becomes rapid as temperatures warm late in winter and early in spring. Drought quickly follows, and by April the plants have usually begun to mature and are soon dead. The dried material cures poorly, and nutrients are rapidly lost as mechanical disintegration and leaching occur. Consequently, grazing is limited primarily to early in spring.

The annual cover is dominantly red brome *(Bromus rubens)*, cheatgrass *(B. tectorum)*, Mediterranean schismus *(Schismus barbatus)*, and foxtail fescue *(Festuca megalura)*. Annual forbs are of secondary importance, although redstem filaree *(Erodium cicutarium)* and tufted storksbill *(E. texanum)* provide important seasonal forage.

At the higher elevations, where annual rainfall averages more than 10 inches, perennial grasses and palatable shrubs are of primary importance. Perennial grasses generally cure well and become green rapidly after summer or fall rains. Palatable shrubs are relatively nutritious throughout the year. Bunchgrasses such as desert needlegrass *(Stipa speciosa)*, Indian ricegrass *(Oryzopsis hymenoides)*, and bluegrass *(Poa spp.)* are common, and in some areas they are abundant. Many common shrubs such as the saltbushes *(Atriplex spp.)*, Nevada ephedra *(Ephedra nevadensis)*, green Mormon-tea *(E. viridis)*, desert bitterbrush *(Purshia glandulosa)*, and desert almond *(Prunus fasciculata)* provide important browse for both livestock and wildlife. Shrub live oak *(Quercus turbinella)* provides both browse and acorns for foraging animals. These trees and shrub species are especially important if new growth is within reach of foraging animals.

Perennial browse and grass plants have limited value as forage if they are allowed to grow rank and coarse or if they are overgrazed. These extreme conditions are common and produce plants that have low vigor and productivity.

The most economical methods for improving the quality and productivity of rangeland in this survey area are grazing and plant management. Technical assistance on planning and applying practices suitable for a particular soil can be obtained from the Soil

Conservation Service and the University of California, Cooperative Extension Service.

The more highly productive areas of rangeland in this survey area are the alluvial fans and mountains. These areas generally are at an elevation of more than 3,500 feet, and the soils produce more than 600 pounds of vegetation per acre per year. Soils that are at lower elevations or that produce very small amounts of forage normally are grazed during the spring in years of normal or favorable precipitation.

Proper grazing management on rangeland can limit soil erosion. Overgrazing increases the hazard of erosion, delays forage production, and generally reduces the length of the primary grazing season. Approximately 700 pounds of air-dry plant residue per acre should be left to prevent accelerated erosion and to promote a desirable balance of grasses and forbs in the following season's forage crop. Returning plant residue or mulch to the soil increases the water intake rate and reduces soil blowing.

Livestock distribution becomes more critical as slope increases. In areas that have slope of more than 50 percent, management is required to obtain a proper level of grazing on the upper part of the slope without overgrazing occurring on the lower part. Techniques for obtaining uniform livestock distribution include placing watering facilities on benches, on ridges, and in other remote areas; placing salt, trace minerals, and nutritional supplements on the slopes and ridges; constructing livestock trails and roads, which can double as firebreaks and access roads; fertilizing areas that receive more than 10 inches of precipitation annually to increase the palatability of forage in remote areas; and constructing fences that force livestock to graze the steepest areas when water is available and forage quality is highest.

Range seeding can increase the carrying capacity of rangeland by replacing brush and other undesirable plants with improved varieties of grasses and legumes. Range seeding generally is not a suitable practice in areas that receive less than 12 inches of precipitation annually.

Brush management and juniper management are important practices on many of the sloping fans at the higher elevations and in upland areas that include rough terrain. Many areas are covered with dense brush or juniper stands, although the potential plant community is dominantly grasses and other forage plants. The range and watershed characteristics of these areas can be improved by mechanical or chemical means or by prescribed burning. Range seeding afterward provides a stable and productive plant cover.

Shallow soils and those in steep areas are unstable and erode easily if disturbed. Wildfires are common, and properly engineered firebreaks and access roads are necessary to prevent gully erosion. Brush management in these areas is actually fuel management and is necessary to prevent extremely hot wildfires. The elimination or rejuvenation of old growth brush and juniper thickets, through the use of relatively cool, controlled burns, reduces the risk of wildfires and increases watershed protection and the esthetic value of the area. Following a controlled burn, an area can provide a combination of grass, browse, and cover suitable for most forms of wildlife. Although difficult to use, forage is generally available for 6 to 9 years after a burn.

Windbreaks

By Harlan D. McIntire, district conservationist, Soil Conservation Service.

A windbreak is a belt of trees or shrubs that is planted at right angle to the prevailing wind and is designed to protect an area. A system of windbreaks on the perimeter of and at specified intervals across a field provides the most complete protection from the wind. The interval depends on the erodibility of the soil and the height of the windbreak.

The entire survey area is subject to strong winds. In winter, high velocity winds are associated mainly with storm fronts moving through the area. Spring brings the most persistent winds, but strong winds can occur at any time of the year.

These winds create a hazard of soil blowing. Winds in spring and early in summer can generate sandstorms over wide areas. The hazard is greatest where the surface layer is sandy, the plant cover is sparse, and the wind has a long, uninterrupted sweep.

By reducing the velocity of the wind in protected areas, windbreaks reduce the damage caused by wind. Wind can damage plants by drying the soil and dehydrating plants and by propelling abrasive, rapidly moving soil particles across tender plants.

Windbreaks are used to protect crops, orchards, feedlots, and farmsteads. They protect recreational areas, rural and urban homes, businesses, industrial areas, schools, railroads, and highways. Windbreaks provide screens for privacy and reduce sound intensity. They add to the beauty of the environment and provide food and shelter for wildlife.

With few exceptions, all effective windbreaks in the area must be irrigated. Because irrigation is costly, single rows are more commonly used than multiple rows. Evergreens are the most effective trees to use in windbreaks because damaging winds occur in winter and early in spring.

Proper fertilization and irrigation can even out the growth of trees planted on the various types of soils in the area. Trees can be grown on coarse-textured soils that have a low or very low available water capacity, on stony soils, and on relatively shallow soils. Special site preparation may be needed in areas where the soils have a hardpan or caliche. On saline soils, onsite

assistance may be needed to determine the degree of reclamation needed and the most suitable species.

The harsh desert climate limits the number of evergreen trees suitable for use in windbreaks. The two most commonly used are Arizona cypress and Athel, which is also called evergreen tamarisk. Athel is suitable for use on very saline-alkali soils or where irrigation water is of poor quality. Arizona cypress is favored in cooler areas and around homesites. Another well adapted evergreen is aleppo pine.

Deciduous trees adapted for use in windbreaks include Siberian elm, black locust, Russian-olive, Arizona ash, and species of poplar. Shrubs adapted for use in windbreaks include big saltbush, pyracantha, pampasgrass, oleander, pomegranate, and giant reed. Many other trees and shrubs have been used with satisfactory results.

Assistance in selecting trees and in planting windbreaks is available from the Soil Conservation Service and the University of California, Cooperative Extension Service.

Recreation

The survey area includes recreational facilities such as the Mojave Narrows Regional Park and numerous ponds. Potential exists for creating additional recreational facilities. Many of the soils in the survey area have limitations for use as recreational areas. These limitations do not preclude development of the soils but indicate features that must be overcome.

The soils of the survey area are rated in table 6 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 6, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 6 can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in table 7 and interpretations for septic tank absorption fields in table 8.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

By Glenn I. Wilcox, area biologist, Soil Conservation Service.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate

Figure 15. Cottonwoods and willows along the Mojave River provide valuable wildlife habitat.

vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants. If vegetation is to be established, use of native plants is desirable. Nonnative plants generally require irrigation and careful management to insure their survival.

Wildlife is an important resource in the survey area although its presence is not always obvious to the casual observer. Wildlife contributes to the esthetic value of the area and is a valuable part of the ecosystem.

It is difficult to assign a monetary value for the help animals provide in the control of weed, insect, and animal pests. Animals such as badgers and coyotes are useful rodent predators, as are golden eagles and red-tailed hawks. Doves, quail, and small birds such as sparrows and finches eat a variety of seeds, many of which are rangeland or cropland weeds. Wrens and swallows eat insects that can harm crops and landscaping plants.

Because water is a limited resource in the survey area, the Mojave River is important to wildlife. Wetlands associated with the river provide habitat for wildlife such as shore birds, ducks, herons, and raccoons. Riparian vegetation including cottonwoods, willows, saltcedar, and associated herbaceous plants provides food and cover (fig. 15).

The Mojave River at one time contained only one species of fish, the Mojave tui chub, which is endangered (*5*). The river now supports introduced fish such as arroyo chubs, various introduced warmwater fish, and trout in the headwaters (*21*). Ponds in the Newberry Springs and Barstow areas support warmwater fish such as largemouth bass, bluegill, and channel catfish.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce

grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include Gambel's quail, pheasant, mourning dove, meadowlark, sparrows, desert cottontail, gray fox, and numerous reptiles including desert tortoise.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants including shadscale and creosotebush. Wildlife attracted to rangeland include kit fox, Mohave ground squirrel, kangaroo rat, chukar, Gambel's quail, thrashers, wrens, and numerous reptiles.

The climatic extremes and the lack of drinking water in the desert influence the kind and number of wildlife that can exist in the area. Desert animals are adapted to the harsh conditions. Many are active only at night or during the cooler morning or evening hours. Through the heat of the day they remain in burrows or dens. Reptiles, such as horned lizards and desert iguanas, and rodents, such as kangaroo rats and ground squirrels, are able to survive on little or no drinking water. Some obtain the water they need from their food; others are able to greatly conserve what little water they drink and require only occasional visits to a water source.

Springs and seep areas attract a variety of wildlife including quail, desert cottontail, and gray fox. In areas where water and associated vegetation is inadequate or nonexistent, development of a dependable water source and establishment of vegetation that provides food and cover is beneficial to wildlife.

Man's activities can influence wildlife and habitat. Whenever vegetation is removed to accommodate a change in land use, it causes a change in wildlife populations. Conversion of large tracts of land usually has an adverse effect on wildlife. Conversion of small tracts can be beneficial to some kinds of wildlife by adding habitat variety and by providing water and food.

Wildlife and habitat in the desert exist in a delicate balance that is easily disturbed and is not easily restored. Protection is often the best management goal.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 7 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or

maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, and shrinking and swelling can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 8 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 8 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly

impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 8 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage because of rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 8 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 9 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to

the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 9, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 10 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, and terraces and diversions.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is

subject to ponding; slope; and susceptibility to flooding. Excavating and grading and the stability of ditch banks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 11 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U. S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials (*1*) and the Unified soil classification system (*2*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 12 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in disturbed areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the amount and proportion of stable aggregates 0.84 millimeter in size and smaller. The groups are represented by USDA textural classes. Soils containing rock fragments can occur in any group.

1. Sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 12, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 13 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 13 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that

delineate flood-prone areas at specific flood frequency levels.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are cemented or indurated subsurface layers within a depth of 5 feet. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A *thin*pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A *thick* pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as*low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as*low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*32*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 14 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Aridisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Argid (*Arg*, from argillic horizon, plus *id*, from Aridisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Natrargids (*Natr*, meaning sodium affected, plus *argid*, the suborder of the Aridisols that have an argillic horizon).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Natrargids.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, thermic Typic Natrargids.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*31*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*32*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Arizo Series

The Arizo series consists of very deep, excessively drained soils on alluvial fans. Arizo soils formed in alluvium derived dominantly from granitic material. Slopes range from 2 to 9 percent.

Soils of the Arizo series are sandy-skeletal, mixed, thermic Typic Torriorthents.

Typical pedon of Arizo gravelly loamy sand, 2 to 9 percent slopes, in Lucerne Valley, 1.4 miles south of intersection of Meridian Road and Agate Road and 0.7 mile east on a trail, in the NW1/4NW1/4SE1/4 of sec. 31, T. 4 N., R. 1 E., in the Lucerne Valley Quadrangle.

C1 0 to 8 inches; very pale brown (10YR 7/3) gravelly loamy sand, pale brown (10YR 6/3) moist; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; common fine interstitial pores; 20 percent pebbles 1/2 to 3/4 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.
C2 8 to 15 inches; very pale brown (10YR 7/3) gravelly loamy sand, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine, fine, and medium roots; common fine interstitial pores; 20 percent pebbles 1/2 to 3/4 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.
C3 15 to 60 inches; pale brown (10YR 6/3) very gravelly loamy coarse sand, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine interstitial pores; 45 percent pebbles 1 to 2 inches in diameter and 10 percent cobbles; lime coatings (1/8 to 1/4 inch thick) on bottom of pebbles and cobbles; disseminated lime; violently effervescent; moderately alkaline.

The profile is mildly alkaline or moderately alkaline throughout. The C1 horizon has color of 10YR 6/3, 6/4, 7/3, or 7/4. It is 6 to 10 inches thick. The C2 horizon ranges from gravelly or very gravelly loamy coarse sand to gravelly or very gravelly loamy sand. The C3 horizon is very gravelly loamy coarse sand or very gravelly loamy sand and is 35 to 60 percent pebbles and cobbles.

Arrastre Series

The Arrastre series consists of moderately deep, well drained soils on upland foothills. Arrastre soils formed in residuum of granitic rock. Slopes range from 30 to 50 percent.

Soils of the Arrastre series are coarse-loamy, mixed, mesic Typic Xerochrepts.

Typical pedon of Arrastre sandy loam, in an area of Arrastre-Rock outcrop complex, 30 to 50 percent slopes, on Grapevine Canyon Road about 1.4 miles north of the radio tower, in the SW1/4NW1/4NE1/4 of sec. 35, T. 4 N., R. 2 W., in the Fifteenmile Valley Quadrangle.

A11 0 to 6 inches; brown (10YR 5/3) sandy loam, dark brown(10YR 4/3) moist; moderate very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; common very fine interstitial pores; 10 to 15 percent pebbles 1/4 to 3/8 inch in diameter; slightly acid; clear smooth boundary.
A12 6 to 17 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots and few fine and medium roots; common very fine interstitial pores; 20 percent pebbles 3/8 inch in diameter; slightly acid; gradual wavy boundary.
B2t 17 to 26 inches; yellowish brown (10YR 5/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots and few coarse and medium roots; common very fine interstitial pores and few very fine tubular pores; 20 percent pebbles 1/4 to 3/8 inch in diameter; few thin clay films between mineral grains; slightly acid; abrupt wavy boundary.
R 26 inches; hard shattered and broken granitic rock.

Depth to hard granitic rock ranges from 20 to 40 inches. The content of gravel ranges from 10 to 25 percent in the solum. The profile is slightly acid or neutral throughout. The content of organic carbon is less than 0.35 percent in the upper third of the solum. The A horizon has color of 10YR 5/3 or 6/4. It is 11 to 19 inches thick. The B2t horizon has color of 10YR 5/3, 5/4, or 5/6 or of 7.5YR 6/6 or 6/8. It is gravelly sandy loam or sandy loam that is 7 to 14 percent clay. It has 0 to 2 percent more clay than the A horizon. Some pedons have a C horizon.

Avawatz Series

The Avawatz series consists of very deep, somewhat excessively drained soils on alluvial fans and in intermittent drainageways. Avawatz soils formed in mixed alluvium derived dominantly from granitic material. Slopes range from 2 to 9 percent.

Soils of the Avawatz series are sandy, mixed, mesic Mollic Xerofluvents.

Typical pedon of Avawatz sandy loam, in an area of Avawatz-Oak Glen association, gently sloping, about 800 feet west and 600 feet south of the intersection of Highway 138 and Sheep Creek Road, in the SE1/4NE1/4SW1/4 of sec. 26, T. 4 N., R. 7 W., in the Phelan Quadrangle.

A1 0 to 15 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and few fine roots; few very fine interstitial pores; 5 percent pebbles 1/2 inch in diameter; neutral; gradual smooth boundary.
C 15 to 60 inches; pale brown (10YR 6/3) loamy sand, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; thin strata of sandy loam 1/2 to 1 inch thick at a depth of less

than 40 inches; 10 percent pebbles 1/2 inch to 2 inches in diameter; neutral.

The content of organic carbon ranges from 0.2 to 0.6 percent in the upper 7 inches of the solum. The A1 horizon has color of 10YR 4/3, 5/2, or 5/3. The content of gravel ranges from 5 to 15 percent. The profile is slightly acid or neutral. The A1 horizon is 8 to 16 inches thick. The C horizon has color of 10YR 5/3, 6/2, or 6/3. It generally has thin strata of sandy loam between depths of 20 and 40 inches; in some pedons, the strata are as deep as 60 inches. The content of gravel ranges from 5 to 15 percent.

Bousic Series

The Bousic series consists of very deep, moderately well drained soils on basin rims. Bousic soils formed in fine-textured alluvium derived from mixed sources. Slopes range from 0 to 1 percent.

Soils of the Bousic series are fine, mixed (calcareous), thermic Typic Torriorthents.

Typical pedon of Bousic clay, approximately 3 miles north of the town of Lucerne Valley, 1 mile east of Highway 247, in the NE1/4SE1/4NE1/4 of sec. 25, T. 5 N., R. 1 W., in the Lucerne Valley Quadrangle.

Ap 0 to 5 inches; very pale brown (10YR 7/3) clay, brown (10YR 5/3) moist; moderate angular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine interstitial pores; disseminated lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1 5 to 24 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; moderate medium and coarse angular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores and common very fine interstitial pores; few fine gypsum crystals at a depth of 18 inches; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C2 24 to 42 inches; light yellowish brown (10YR 6/4) clay, yellowish brown (10YR 5/4) moist; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine and common medium roots; few very fine interstitial and tubular pores; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C3ca 42 to 60 inches; light yellowish brown (10YR 6/4) clay, yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few very fine interstitial pores; disseminated lime; about 20 percent calcium carbonate equivalent and lime segregated in common fine soft masses; violently effervescent; moderately alkaline.

The upper 36 inches of the profile is moderately alkaline or strongly alkaline and is strongly saline-alkali. Some gypsum is present in the upper part of the profile in most pedons. The content of organic carbon decreases regularly as depth increases. The clay content of the control section ranges from 45 to 55 percent. It gradually increases as depth increases and is as much as 70 percent at a depth of 60 inches.

The Ap or A1 horizon has color of 10YR 6/3, 6/4, or 7/3. It is 4 to 6 inches thick. The C1 and C2 horizons to a depth of about 40 inches are 10YR 6/3 or 6/4. They are clay or silty clay. The C3ca horizon has color of 10YR 6/3, 6/4, 7/1, or 7/2. Lime is segregated below a depth of 40 inches in few to common, fine to medium, soft masses and hard concretions. The calcium carbonate equivalent in the C3ca horizon ranges from 15 to 30 percent to a depth of 60 inches or more, but it decreases to 10 to 25 percent as depth increases.

Bryman Series

The Bryman series consists of very deep, well drained soils on terraces and old alluvial fans. Bryman soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 15 percent. The surface has been reworked by the wind.

Soils of the Bryman series are fine-loamy, mixed, thermic Typic Haplargids.

Typical pedon of Bryman loamy fine sand, 0 to 2 percent slopes, about 2 miles west of Adobe Corners, 100 yards north of intersection of Pearblossom Highway and Duncan Road, in the SW1/4SW1/4NW1/4 of sec. 20, T. 5 N., R. 5. W., in the Adelanto Quadrangle.

A11 0 to 4 inches; pale brown(10YR 6/3) loamy fine sand, dark brown (10YR 4/3) moist; moderate medium and thick platy structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; moderately alkaline; abrupt smooth boundary.

A12 4 to 9 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; moderately alkaline; clear smooth boundary.

B1t 9 to 12 inches; brown (7.5YR 5/4) sandy loam, dark brown(7.5YR 4/4) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; few fine roots; common very fine tubular pores; few thin clay films as bridges between mineral grains; 3 percent pebbles 1/4 inch in diameter; moderately alkaline; clear smooth boundary.

B21t 12 to 24 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; strong coarse prismatic structure; hard, firm, sticky and

plastic; few fine roots; common very fine tubular pores; many moderately thick clay films on faces of peds and lining pores; 4 percent pebbles 1/4 inch in diameter; moderately alkaline; gradual smooth boundary.

B22t 24 to 32 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium angular blocky structure; hard, firm, sticky and plastic; few fine roots; roots are oriented along ped surfaces; common very fine tubular pores; common moderately thick clay films on faces of peds and lining pores; 4 percent pebbles 1/4 inch in diameter; moderately alkaline; gradual wavy boundary.

B31tca 32 to 46 inches; pink (7.5YR 7/4) sandy loam, brown(7.5YR 5/4) moist; moderate fine and medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; few very fine tubular pores; common thin clay films as bridges between mineral grains and lining pores; 1 krotovina at a depth of about 45 inches; disseminated lime; segregated lime as common fine seams 1 to 2 millimeters thick coating peds; slightly effervescent; moderately alkaline; gradual wavy boundary.

B32t 46 to 66 inches; light brown (7.5YR 6/4) loamy sand, dark brown (7.5YR 4/4) moist; moderate medium and fine subangular blocky structure; slightly hard, firm, nonsticky and nonplastic; common thin clay films as bridges between mineral grains; moderately alkaline; gradual wavy boundary.

B33t 66 to 80 inches; light brown (7.5YR 6/4) loamy sand, dark brown (7.5YR 4/4) moist; massive; hard, firm, nonsticky and nonplastic; few thin clay films as bridges between mineral grains; moderately alkaline; gradual wavy boundary.

C1 80 to 99 inches; light yellowish brown (10YR 6/4) sand, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 5 percent pebbles 1/2 inch in diameter; moderately alkaline.

The solum is 40 to 90 inches thick. Depth to free carbonates ranges from 24 to 32 inches.

The A horizon has color of 10YR 5/4, 6/3, 6/4, 7/3, or 7/4. In a few pedons it has color of 7.5YR 7/2 or 7/4. It is loamy fine sand or stony sand, and in overwash areas or near basins it is sandy clay loam. The A horizon ranges from neutral to moderately alkaline, and some pedons are slightly effervescent in the upper few inches. The A horizon is 6 to 18 inches thick.

The B2t horizon typically has color of 5YR 4/4, 5/3, 5/4, 6/6, or 6/8, but it is 7.5YR 6/4 or 6/6 in some pedons. It is sandy clay loam or clay loam that is 20 to 35 percent clay. In a few pedons it is gravelly sandy clay loam that is 15 to 30 percent coarse fragments. It is mildly alkaline or moderately alkaline.

The B31tca horizon typically has color of 7.5YR 5/6, 5/8, or 7/4, but it is 10YR 7/3 or 7/4 in some pedons. Typically, it is sandy loam or loam, but in some pedons it is gravelly sandy loam. Lime is segregated in few to common, fine to medium seams, threads, and soft masses. Some pedons do not have a B32t or B33t horizon.

The C horizon ranges from loamy coarse sand to sand, but in some pedons it is gravelly coarse sand. The content of gravel ranges from 5 to 20 percent.

Bull Trail Series

The Bull Trail series consists of very deep, well drained soils on old alluvial fans and terraces. Bull Trail soils formed in alluvium derived dominantly from granitic material. Slopes range from 15 to 30 percent.

Soils of the Bull Trail series are fine-loamy, mixed, mesic Mollic Haploxeralfs.

Typical pedon of Bull Trail sandy loam, in an area of Wrightwood-Bull Trail association, sloping, about 1.9 miles south of Phelan Road on Sonora Road, in the SE1/4SE1/4SW1/4 of sec. 28, T. 4 N., R. 6 W., in the Phelan Quadrangle.

A1 0 to 4 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate very fine and fine subangular blocky structure; hard, friable, sticky and plastic; few fine roots and common very fine roots; few very fine interstitial pores; 5 percent pebbles 1/4 to 3/8 inch in diameter; neutral; clear smooth boundary.

B2t 4 to 19 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; strong medium angular blocky structure; hard, friable, sticky and plastic; few fine roots and common very fine roots; few very fine interstitial pores; few moderately thick clay films on faces of peds and many moderately thick clay films as bridges between mineral grains and lining pores; 10 percent pebbles 1/4 to 1/2 inch in diameter; neutral; gradual smooth boundary.

B31t 19 to 32 inches; reddish yellow (7.5YR 6/6) sandy loam, strong brown (7.5YR 5/6) moist; strong fine and medium angular block structure; hard, friable, sticky and plastic; few fine and very fine roots; few fine tubular and very fine interstitial pores; few moderately thick clay films on faces of peds and many moderate thick clay films as bridges between mineral grains and lining pores; 10 percent pebbles 1/4 to 1/2 inch in diameter; neutral; gradual smooth boundary.

B32t 32 to 60 inches; reddish yellow (7.5YR 6/6) sandy loam, strong brown (7.5YR 5/6) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine tubular and very fine interstitial pores; many moderately thick clay films as bridges between

mineral grains and lining pores; 5 percent pebbles 1/4 inch in diameter; neutral.

The solum is 48 to 60 inches thick. The content of organic carbon is 0.6 percent or more to a depth of 5 inches.

The A1 horizon has color of 10YR 4/3 or 5/3. The profile is slightly acid or neutral. The content of gravel ranges from 5 to 10 percent. The horizon is 4 to 6 inches thick.

The B2t horizon has color of 5YR 5/3, 5/4, 5/6, or 5/8. In a few pedons it has color of 7.5YR 6/6 or 6/8. It is sandy clay loam, loam, or gravelly sandy clay loam. The content of gravel is 5 to 25 percent.

The B3t horizon has color of 7.5YR 6/6 or 6/8. In some pedons it has color of 10YR 7/6 or 7/8. It is sandy loam or loamy sand. The content of gravel ranges from 5 to 15 percent. The content of cobbles ranges from 0 to 5 percent.

The Bull Trail soils in this survey area are a taxadjunct to the series. The reaction of the A horizon is neutral, and the B2t horizon has hue of 5YR or color of 7.5YR 6/6 or 6/8. These characteristics are outside the defined ranges for the series. These differences, however, do not significantly affect the use and management of the soils.

Cajon Series

The Cajon series consists of very deep, somewhat excessively drained soils on alluvial fans and river terraces. Cajon soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 15 percent.

Soils of the Cajon series are mixed, thermic Typic Torripsamments.

Typical pedon of Cajon sand, 0 to 2 percent slopes, about 5 miles east of Lucerne Valley, 0.5 mile east of intersection of Visalia Avenue and Foothill Road, and 0.3 mile north, in the NE1/4SE1/4SE1/4 of sec. 16, T. 4 N., R. 1 E., in the Lucerne Valley Quadrangle.

A1 0 to 2 inches; light gray (10YR 7/2) sand, light brownish gray (10YR 6/2) moist; weak medium and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine roots; many very fine interstitial pores; disseminated lime; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1 2 to 7 inches; very pale brown (10YR 7/3) sand, light gray (10YR 7/2) moist; single grain; loose; common fine roots; many very fine interstitial pores; 1 to 2 percent pebbles 1/4 to 3/8 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C2 7 to 13 inches; very pale brown (10YR 7/3) sand, brown (10YR 5/3) moist; single grain; loose; common fine roots; common very fine interstitial pores; 1 to 2 percent pebbles 1/4 to 3/8 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; diffuse wavy boundary.

C3 13 to 18 inches; very pale brown (10YR 7/3) sand, brown (10YR 5/3) moist; single grain; loose; common fine roots; many very fine interstitial pores; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C4 18 to 25 inches; very pale brown (10YR 7/3) sand, pale brown (10YR 6/3) moist; single grain; loose; common fine roots; many very fine interstitial pores; 4 percent pebbles 1/2 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; abrupt wavy boundary.

IIC5 25 to 38 inches; very pale brown (10YR 7/4) gravelly sand, light yellowish brown (10YR 6/4) moist; single grain; loose; common fine roots; many fine interstitial pores; 25 percent pebbles 1/2 to 1 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

IIC6 38 to 45 inches; very pale brown (10YR 7/3) gravelly sand, pale brown (10YR 6/3) moist; single grain; loose; few very fine roots; many fine interstitial pores; 20 percent pebbles 1/2 to 1 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; abrupt wavy boundary.

IIC7 45 to 60 inches; very pale brown (10YR 7/4) sand, light yellowish brown (10YR 6/4) moist; single grain; loose; few very fine roots; common fine interstitial pores; disseminated lime; strongly effervescent; moderately alkaline.

The content of gravel ranges from 0 to 35 percent in all horizons. The profile is mildly alkaline or moderately alkaline throughout.

The upper 10 inches of the profile has color of 10YR 6/4, 7/2, 7/3, or 7/4. The A horizon is 0 to 10 inches thick. It is sand, gravelly sand, or loamy sand. The C horizon has color of 10YR 6/4, 7/3, or 7/4. It is gravelly sand, sand, or loamy sand. Some pedons have strata of sandy loam to sandy clay loam below a depth of 40 inches.

Map unit 116, Cajon loamy sand, 5 to 9 percent slopes, is a taxadjunct to this series. The soil has a weakly developed B2 horizon that does not exhibit the range of characteristics defined for the series. This difference, however, does not significantly affect its use and management.

Cave Series

The Cave series consists of shallow, well drained soils on lower margins of alluvial fans. Cave soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 2 percent.

Soils of the Cave series are loamy, mixed, thermic, shallow Typic Paleorthids.

Typical pedon of Cave loam, dry, 0 to 2 percent slopes, in Lucerne Valley, about 200 yards west and 0.5 mile north of intersection of Camp Rock Road and Rabbit Springs Road, in the NE1/4NE1/4SE1/4 of sec. 3, T. 4 N., R. 1 E., in the Cougar Buttes Quadrangle.

A1 0 to 6 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and slightly plastic; few fine and very fine roots; many very fine interstitial pores and few very fine tubular pores; disseminated lime; violently effervescent; moderately alkaline; clear smooth boundary.

C1ca 6 to 14 inches; very pale brown (10YR 7/3) loam; very pale brown (10YR 7/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine interstitial pores; disseminated lime and many medium soft masses and concretions; violently effervescent; moderately alkaline; clear wavy boundary.

C2cam 14 to 21 inches; white (10YR 8/1) indurated hardpan, light gray (10YR 7/1) moist; strong medium and thick platy structure; extremely hard, extremely firm, nonsticky and nonplastic; few very fine roots between plates; few very fine tubular pores; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C3ca 21 to 31 inches; light gray (10YR 7/2) loam, very pale brown (10YR 7/3) moist; massive; very hard, very firm, slightly sticky and slightly plastic; common very fine tubular pores; disseminated lime and 5 percent medium and large hard irregular concretions and few fine soft masses; strongly effervescent; moderately alkaline; diffuse smooth boundary.

C4 31 to 52 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine interstitial pores; disseminated lime and segregated lime as few fine soft masses; very slightly effervescent; moderately alkaline; clear smooth boundary.

C5 52 to 66 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine interstitial pores; disseminated lime and segregated lime as few fine soft masses; very slightly effervescent; moderately alkaline.

Depth to a petrocalcic horizon ranges from 14 to 20 inches. Disseminated lime is strongly effervescent or violently effervescent above the petrocalcic horizon.

The A1 horizon has color of 10YR 6/3, 6/4, 7/3, or 7/4. It is 5 to 8 inches thick.

The C1 horizon has color of 10YR 6/3, 7/3, or 7/4. The C3 horizon has color of 10YR 6/2, 7/1, or 7/2. The content of concretions and soft masses of lime ranges from 15 to 30 percent. The part of the C horizon below the C3 horizon is loam, sandy loam, and sand. There generally are some thin gravelly lenses. The content of concretions and soft masses of lime ranges from 5 to 15 percent.

The Cave soils in this survey area are in a dry phase of the Cave series. The moisture control section as defined for the series is moist for 30 to 40 days during the summer; however, in this survey area, these soils do not receive moisture in summer and are dry.

Crafton Series

The Crafton series consists of moderately deep, well drained soils on foothills and uplands. Crafton soils formed in residuum of granitic rock. Slopes range from 15 to 50 percent.

Soils of the Crafton series are coarse-loamy, mixed, mesic Entic Haploxerolls.

Typical pedon of Crafton sandy loam, in an area of Crafton-Sheephead-Rock outcrop association, steep, on Grapevine Canyon Road, about 150 feet south and 1,400 feet west of the northeast corner of sec. 2, T. 3 N., R. 2 W., in the Fifteenmile Valley Quadrangle.

A11 0 to 4 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3)moist; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; common very fine interstitial pores; 10 percent pebbles 1/4 inch in diameter; slightly acid; clear smooth boundary.

A12 4 to 10 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) sandy loam; moderate very fine and fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine and few fine roots; common very fine and few fine interstitial pores; 10 percent pebbles 3/8 inch in diameter; slightly acid; clear wavy boundary.

C1 10 to 18 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and few fine and coarse roots; common very fine and few fine interstitial pores; 10 percent pebbles 1/2 inch in diameter; slightly acid; gradual smooth boundary.

C2 18 to 35 inches; light yellowish brown (10YR 6/4) gravelly sand loam, yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots and few medium roots; few very fine and fine interstitial pores; 20 percent pebbles 1/2 inch in diameter; slightly acid; gradual wavy boundary.

C3r 35 inches; broken, shattered, somewhat weathered granitic rock.

Depth to contact with weathered granitic rock ranges from 20 to 40 inches. Base saturation ranges from 75 to 90 percent.

The A1 horizon has color of 10YR 4/2, 5/2, or 5/3. It is 10 to 18 inches thick. The content of gravel ranges from 5 to 15 percent. The C horizon has color of 10YR 5/3, 5/4, 6/3, or 6/4. It is sandy loam 5YR 5/4 or 5/6. In some pedons it has color of 7.5YR 7/4. It is sandy clay loam or gravelly sandy loam. The content of gravel ranges from l0 to 20 percent.

Cuddeback Series

The Cuddeback series consists of moderately deep, well drained soils on terraces and alluvial fans. Cuddeback soils formed in alluvium derived from mixed sources. Slopes range from 2 to 9 percent.

Soils of the Cuddeback series are fine-loamy, mixed, thermic Typic Durargids.

Typical pedon of Cuddeback sandy loam (fig. 16), in an area of Nebona-Cuddeback complex, 2 to 9 percent slopes, about 3.5 miles northeast of Victorville, about 300 feet south and 1,500 feet east of the northwest corner of section 27, on powerline maintenance road, in the NW1/4NE1/4NW1/4 of sec. 27, T. 6 N., R. 4 W., in the Victorville Quadrangle.

The surface layer is covered by a fairly well developed desert pavement of pebbles and cobbles that have a desert varnish on exposed surfaces. Some nonvarnished granitic and limestone gravel is intermixed.

A1 0 to 3 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak thin and medium platy structure in the upper 2 inches and moderate fine subangular blocky structure in the lower 1 inch; slightly hard, friable, nonsticky and nonplastic; few very fine vesicular pores; 5 percent pebbles 1/4 to 3/4 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; abrupt smooth boundary.

B1t 3 to 6 inches; yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6) moist; moderate very fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine and fine roots; common very fine interstitial pores and few fine tubular pores; many thin clay films as bridges between mineral grains and lining pores; 5 percent pebbles 1/2 to 1 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

B2t 6 to 17 inches; reddish brown (5YR 5/4) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; strong medium and coarse angular blocky structure; hard, friable, sticky and plastic; few very fine, fine, and medium roots; common very fine interstitial pores and few fine tubular pores; few moderately thick clay films on faces of peds and many moderately thick clay films as bridges between mineral grains and lining pores; 20 percent pebbles 1/4 to 3/4 inch in diameter and 3 percent cobbles; mildly alkaline; clear smooth boundary.

Figure 16. Profile of Cuddeback sandy loam. Depth to the duripan is about 24 inches.

B31t 17 to 27 inches; yellowish red (5YR 5/6) gravelly sandy loam, yellowish red (5YR 4/5) moist; massive; hard, firm, slightly sticky and nonplastic; few very fine roots; few very fine interstitial pores and common very fine tubular pores; many thin clay films as bridges between mineral grains and lining pores; 20 percent pebbles 1/2 to 1 1/2 inches in diameter; mildly alkaline; clear smooth boundary.

B32t 27 to 34 inches; strong brown (7.5YR 5/5) loamy sand, dark brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine roots; few very fine interstitial and tubular pores; common thin clay films as bridges between mineral grains; 10 percent pebbles 1/2 to 3/4 inch in diameter; disseminated lime and segregated lime in few fine soft masses; strongly effervescent; moderately alkaline; abrupt irregular boundary.

C1sicam 34 to 38 inches; hard, massive, continuous, indurated duripan.

Thickness of the solum and depth to the duripan range from 20 to 40 inches. The solum is slightly saline. The sodium adsorption ratio is 2 to 10. The solum is mildly alkaline or moderately alkaline. A desert pavement of varnished pebbles and cobbles 3/8 inch to 5 inches in diameter covers 40 to 60 percent of the surface layer.

The A horizon has color of 10YR 1/3, 6/4, 7/3, or 7/4. The content of gravel ranges from 5 to 10 percent. The horizon is 1 inch to 4 inches thick.

The B2t horizon has color of 5YR 5/4 or 5/6. In some pedons it has color of 7.5YR 7/4. It is sandy clay loam or gravelly sandy clay loam. The content of gravel and cobbles ranges from 10 to 25 percent.

The duripan is 1 inch to 15 inches or more thick. It is continuous and has opal caps 2 to 3 millimeters thick. In some pedons it is lamellar or is slightly platy.

Cushenbury Series

The Cushenbury series consists of moderately deep, well drained soils on mountainous uplands. Cushenbury soils formed in residuum of granitic rock. Slopes range from 15 to 30 percent.

Soils of the Cushenbury series are coarse-loamy, mixed, mesic Typic Haploxerolls.

Typical pedon of Cushenbury loamy sand, in an area of Cushenbury-Crafton-Rock outcrop complex, 15 to 50 percent slopes, on Oak Springs Ranch Road, about 0.5 mile north of Oak Springs Ranch, in the NW1/4SE1/4SE1/4 of sec. 5, T. 3 N., R. 2 W., in the Butler Peak Quadrangle.

A11 0 to 14 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine interstitial pores; 10 percent pebbles 1/4 to 3/8 inch in diameter; neutral; gradual smooth boundary.

A12 14 to 27 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine interstitial pores; 10 percent pebbles 1/4 to 3/8 inch in diameter; slightly acid; gradual smooth boundary.

B2t 27 to 39 inches; yellowish brown (10YR 5/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; strong medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; few very fine and fine roots; common very fine interstitial pores and few very fine tubular pores; few thin clay films as bridges between mineral grains; 20 percent pebbles; slightly acid; gradual smooth boundary.

Cr 39 inches; weathered granitic rock.

Depth to contact with weathered granitic rock ranges from 20 to 40 inches. The content of gravel in the solum ranges from 10 to 25 percent. The A horizon has color of 10YR 4/3, 5/2, or 5/3. Base saturation ranges from 75 to 90 percent. The content of organic carbon decreases to less than 0.6 percent at a depth of about 14 inches. The A horizon is 13 to 28 inches thick. The B2t horizon has color of 10YR 5/3 or 5/4 or of 7.5YR 5/6 or 5/8. It is gravelly sandy loam or sandy loam. It has 0 to 3 percent more clay than the A horizon.

Glendale Variant

The Glendale Variant consists of very deep, moderately well drained soils on basin rims and lower margins of narrow alluvial fans. Glendale Variant soils formed in alluvium derived from mixed sources. Slopes range from 0 to 2 percent.

Glendale Variant soils are fine-silty, mixed (calcareous), thermic Typic Torrifluvents.

Typical pedon of Glendale Variant silt loam, saline-alkali, approximately 1,100 feet east and 200 feet north of the intersection of Lincoln Road and Cambria Road, in the NE1/4SW1/4SW1/4 of sec. 28, T. 5 N., R. 1 E., in the Lucerne Valley Quadrangle.

A1 0 to 11 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; moderate very thin and thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; disseminated lime; violently effervescent; strongly alkaline; clear smooth boundary.

C1 11 to 40 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and plastic; few very fine roots; common very fine tubular pores; disseminated

lime; violently effervescent; moderately alkaline; clear smooth boundary.

C2 40 to 53 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and plastic; few very fine roots; few very fine tubular pores; disseminated lime; violently effervescent; moderately alkaline; clear smooth boundary.

C3 53 to 65 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; few very fine tubular pores; disseminated lime; violently effervescent; moderately alkaline.

The profile is moderately alkaline or strongly alkaline throughout. It is moderately saline-alkali or strongly saline-alkali to a depth of about 30 inches. The A1 horizon has color of 10YR 6/3, 7/3, or 7/4. It is 8 to 12 inches thick. The C horizon has color of 10YR 5/4, 5/6, 6/3, or 6/4. Below a depth of 40 inches in some pedons, there are strata of loam and clay loam or segregated lime in seams, soft masses, and concretions. Also, in some pedons there are salt crystals below a depth of 20 inches.

Glendale Variant soils are similar to Glendale soils except that they are dry in the 4- to 12-inch moisture control section from May to October. Glendale soils normally are moist in some part of the control section for 30 to 40 days during July, August, or September.

Halloran Series

The Halloran series consists of very deep, moderately well drained soils on old river terraces. Halloran soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 2 percent. The surface has been modified by wind action.

Soils of the Halloran series are coarse-loamy, mixed, thermic Typic Natrargids.

Typical pedon of Halloran sandy loam, northeast of Newberry Springs, 0.75 mile south and 30 feet west of the intersection of Fremont Road and Fairview Road, near the SE1/4NE1/4SE1/4 of sec. 35, T. 9 N., R. 3 E., in the Newberry Quadrangle.

A1 0 to 2 inches; very pale brown (10YR 7/4) sand, yellowish brown (10YR 5/4) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; few very fine interstitial pores; 4 percent pebbles 1/4 to 3/8 inch in diameter; disseminated lime; slightly effervescent; moderately alkaline; abrupt smooth boundary.

B2tca 2 to 9 inches; reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4) moist; strong medium prismatic structure; light gray (10YR 7/2) vesicular caps 1/8 inch thick on prisms; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots on faces of peds; few very fine and fine tubular pores and common very fine interstitial pores; common moderately thick clay films on faces of peds and many thin clay films as bridges between mineral grains and lining tubular pores; 4 percent pebbles 1/4 to 3/8 inch in diameter; disseminated lime (8 percent calcium carbonate) and lime segregated in common fine and medium soft masses and filaments; strongly effervescent; strongly alkaline; clear smooth boundary.

B3tca 9 to 21 inches; reddish yellow (7.5YR 6/6) sandy loam, strong brown (7.5YR 5/6) moist; moderate medium angular blocky structure; hard, friable, slightly sticky and nonplastic; few very fine roots; few fine tubular pores and common very fine interstitial pores; few thin clay films on faces of peds and many thin clay films as bridges between mineral grains and lining tubular pores; 4 percent pebbles 1/4 to 3/8 inch in diameter; disseminated lime (5 percent calcium carbonate) and lime segregated in common fine and medium soft masses and filaments; strongly effervescent; strongly alkaline; gradual wavy boundary.

C1 21 to 29 inches; yellow (10YR 7/6) loamy sand, yellowish brown (10YR 5/6) moist; common fine distinct yellow (10YR 8/8) mottles; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; 5 percent pebbles 1/4 to 3/8 inch in diameter; moderately alkaline; clear smooth boundary.

C2 29 to 33 inches; brown (10YR 5/3) loamy sand, very pale brown (10YR 7/3) moist; massive; hard, friable, nonsticky and nonplastic; few very fine interstitial pores; 4 percent pebbles 1/4 to 3/8 inch in diameter; matrix is noncalcareous; lime segregated in few fine soft masses; moderately alkaline; clear smooth boundary.

C3 33 to 50 inches; yellowish brown (10YR 5/4) sandy loam, light yellowish brown (10YR 6/4) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; few very fine and fine interstitial pores; 5 percent pebbles 1/2 inch in diameter; few dark brown (10YR 4/3) oblique and discontinuous lamellar bands of sandy loam 1/4 to 3/8 inch thick; few very fine gypsum crystals; few soft manganese masses 1/8 inch in diameter; disseminated lime; slightly effervescent; moderately alkaline; clear smooth boundary.

C4 50 to 60 inches; mixed yellow (10YR 7/6) and yellowish brown (10YR 5/4) loamy fine sand, pale brown (10YR 6/3) and dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strata of 3/8-inch-thick lenses of sandy loam; disseminated lime; slightly effervescent; moderately alkaline.

The solum is 15 to 22 inches thick.

The A1 horizon has color of 10YR 6/4, 7/3, or 7/4. It is mildly alkaline or moderately alkaline. It is 0 to 2 inches thick.

In some places a thin sandy loam or loamy fine sand A2 horizon caps the B2tca horizon. The A2 horizon is 1/8 inch to nearly 1 inch thick, and it has color of 10YR 7/2, 7/3, or 8/3.

The B2tca horizon has color of 5YR 5/4 or 5/6 or of 7.5YR 5/4 or 6/4. It is strongly alkaline or very strongly alkaline. Lime is segregated in few to common, fine to medium, soft masses and filaments. The electrical conductivity ranges from 4.4 to 45 millimhos per centimeter. Content of exchangeable sodium is more than 15 percent. In most pedons the content of exchangeable sodium ranges from 44 to 70 percent. Structure is prismatic or columnar.

The C horizon is sand, loamy sand, loamy fine sand, or sandy loam. Most profiles contain alternating strata, generally discontinuous or oblique, of sandy loam and coarser textured material. Mottles are few or common, fine or medium, and faint or distinct. In most pedons there are fine gypsum crystals. The C horizon is moderately alkaline to very strongly alkaline.

Hanford Series

The Hanford series consists of very deep, well drained soils on alluvial fans. Hanford soils formed in alluvium derived dominantly from granitic material. Slopes range from 2 to 9 percent.

Soils of the Hanford series are coarse-loamy, mixed, nonacid, thermic Typic Xerorthents.

Typical pedon of Hanford sandy loam, cool, 2 to 9 percent slopes, south of Phelan, 2,600 feet south and 25 feet east of the intersection of Silver Rock Road and Phelan Road, in the SW1/4SW1/4NE1/4 of sec. 21, T. 4 N., R. 7 W., in the Phelan Quadrangle.

A1 0 to 12 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; massive; hard, friable, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; 10 percent pebbles 1/4 to 1/2 inch in diameter; slightly acid; gradual smooth boundary.

C1 12 to 32 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; common very fine and few fine roots; many very fine interstitial pores; 10 percent pebbles 3/4 inch to 1 1/2 inches in diameter; neutral; gradual smooth boundary.

C2 32 to 60 inches; light yellowish brown (10YR 6/4) coarse sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; many very fine and common fine interstitial pores; 10 percent pebbles 1 inch to 2 inches in diameter; neutral.

The A1 horizon has color of 10YR 6/2 or 6/3. The content of gravel ranges from 5 to 15 percent. The A1 horizon is 8 to 12 inches thick. The C horizon has color of 10YR 6/3 or 6/4. It is sandy loam or coarse sandy loam. In some pedons the lower part of the C horizon at a depth of 44 to 50 inches is loamy coarse sand or gravelly sandy loam. Some pedons are slightly effervescent below a depth of 48 inches.

Hanford soils in the survey area are in a cool phase of the Hanford series. They are in high positions, and the average air temperature is at the low extreme of the defined range of characteristics for the series.

Helendale Series

The Helendale series consists of very deep, well drained soils on alluvial fans and terraces. Helendale soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 5 percent.

Soils of the Helendale series are coarse-loamy, mixed, thermic Typic Haplargids.

Typical pedon of Helendale loamy sand, 0 to 2 percent slopes, 2 miles east and 0.5 mile north of the intersection of Pearblossom Highway and Johnson Road, on Wilson Ranch Road in the SW1/4SW1/4SW1/4 of sec. 16, T. 5 N., R. 6 W., in the Shadow Mountains in the Southeast Quadrangle.

A1 0 to 4 inches; very pale brown (10YR 7/4) loamy sand, dark yellowish brown (10YR 4/4) moist; moderate thin and medium platy structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common very fine interstitial pores; moderately alkaline; abrupt smooth boundary.

B21t 4 to 6 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, sticky and slightly plastic; common very fine roots; common very fine interstitial and tubular pores; many moderately thick clay films on faces of peds, lining pores, and as bridges between mineral grains; 3 percent pebbles 1/8 to 1/4 inch in diameter; mildly alkaline; clear smooth boundary.

B22t 6 to 18 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium angular blocky; hard, friable, slightly sticky and nonplastic; few very fine roots; common very fine and fine interstitial pores; many thin clay films on faces of peds, lining pores, and as bridges between mineral grains; 3 percent pebbles 1/8 to 1/4 inch in diameter; mildly alkaline; gradual smooth boundary.

B23t 18 to 30 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate fine and medium angular blocky; hard, friable, slightly sticky and

nonplastic; few fine and very fine roots; few fine tubular pores and common very fine interstitial pores; few thin clay films lining pores and as bridges between mineral grains; 5 percent pebbles 1/8 to 1/4 inch in diameter; mildly alkaline; diffuse smooth boundary.

B31t 30 to 39 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; few fine roots; few fine tubular pores and very fine interstitial pores; few thin clay films lining pores and as bridges between mineral grains; 5 percent pebbles 1/8 to 1/4 inch in diameter; mildly alkaline; diffuse smooth boundary.

B32t 39 to 48 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; few fine roots; few fine tubular pores and very fine interstitial pores; few thin clay films lining pores and as bridges between mineral grains; 5 percent pebbles 1/8 to 1/4 inch in diameter; mildly alkaline; clear wavy boundary.

C1ca 48 to 66 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; hard, very friable, nonsticky and nonplastic; disseminated lime and lime segregated in few fine seams; strongly effervescent; moderately alkaline; clear wavy boundary.

C2 66 to 106 inches; yellow (10YR 7/6) loamy sand, yellowish brown (10YR 5/6) moist; massive; hard, very friable; disseminated lime and lime segregated in few fine seams; slightly effervescent; moderately alkaline.

The solum is 30 to 48 inches thick. The content of gravel ranges from 0 to 15 percent in the solum. The profile is mildly alkaline or moderately alkaline throughout.

The A horizon has color of 10YR 6/3, 6/4, or 7/4. It is 4 to 8 inches thick. The B2t horizon has color of 7.5YR 5/4 or 6/4 or of 10YR 5/3. It is sandy loam or fine sandy loam. The C horizon is sandy loam, loamy fine sand, or loamy sand.

Hesperia Series

The Hesperia series consists of very deep, well drained soils on alluvial fans. Hesperia soils formed in alluvium derived dominantly from granitic material. Slopes range from 2 to 5 percent.

Soils of the Hesperia series are coarse-loamy, mixed, nonacid, thermic Xeric Torriorthents.

Typical pedon of Hesperia loamy fine sand, 2 to 5 percent slopes, about 25 feet west and 200 feet south of the northeast corner of section 34, in the SE1/4NE1/4NE1/4 of sec. 34, T. 4 N., R. 5 W., in the Baldy Mesa Quadrangle.

A1 0 to 6 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; upper 1 inch is brown (10YR 4/3); weak very fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; few very fine interstitial pores; 5 percent pebbles 1/4 to 3/8 inch in diameter; moderately alkaline; gradual smooth boundary.

C1 6 to 12 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak very fine and fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common very fine interstitial pores; 5 percent pebbles 1/4 to 3/8 inch in diameter; 5 to 10 percent of matrix is disseminated lime; slightly effervescent; moderately alkaline; gradual smooth boundary.

C2 12 to 42 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; moderate very fine and fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; two channels 1 inch in diameter made by burrowing animals to a depth of about 40 inches; 5 percent pebbles 1/4 to 3/4 inch in diameter; 75 to 85 percent of matrix is disseminated lime; slightly effervescent; moderately alkaline; gradual smooth boundary.

C3 42 to 60 inches; very pale brown (10YR 7/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, nonsticky and nonplastic; few very fine interstitial pores; few brown (10YR 4/3) lamellar bands 1/2 to 1 inch thick at a depth of 46 inches; 10 percent pebbles 1/4 to 1/2 inch in diameter; disseminated lime; slightly effervescent; moderately alkaline.

The profile is mildly alkaline or moderately alkaline throughout. The A horizon has color of 10YR 6/3 or 6/4. The content of gravel ranges from 0 to 10 percent. The A horizon is noncalcareous and is 6 to 10 inches thick. The C horizon varies in content of free carbonates below a depth of about 12 inches. The content of gravel ranges from 5 to 15 percent.

Joshua Series

The Joshua series consists of moderately deep, well drained soils on old terraces that have a desert pavement. Joshua soils formed in alluvium derived from mixed sources. Slopes range from 2 to 15 percent.

Soils of the Joshua series are fine-loamy, mixed, thermic Haplic Durargids.

Typical pedon of Joshua loam, 2 to 5 percent slopes (fig. 17), about 1,600 feet east and 2,000 feet south of the northwest corner of section 28 and 300 feet northwest of the gas pipeline maintenance trail, in the

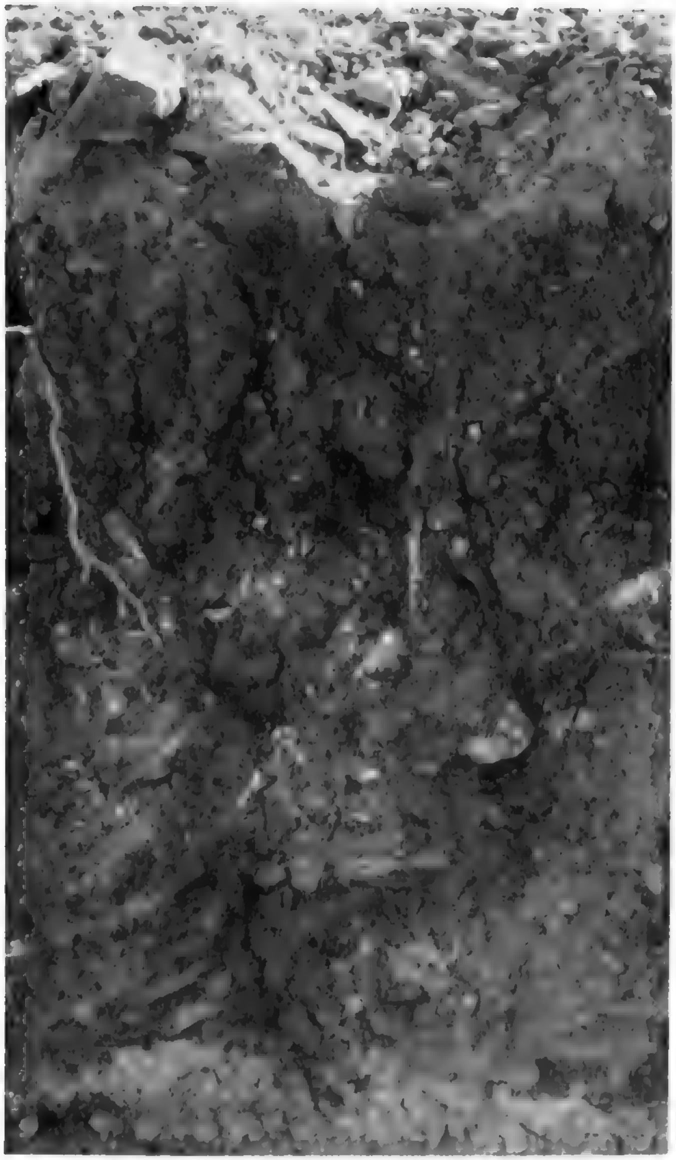

Figure 17. Discontinuous white silica lenses are at a depth of 20 inches in a typical pedon of Joshua loam, 2 to 5 percent slopes.

NW1/4SE1/4NW1/4 of sec. 28, T. 7 N., R. 4 W., in the Helendale Quadrangle.

The soil surface has a well developed desert pavement of pebbles and cobbles that have a desert varnish on exposed surfaces.

A1 0 to 3 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; disseminated lime; slightly effervescent; mildly alkaline; abrupt smooth boundary.

B1t 3 to 6 inches; brown (7.5YR 5/4) gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; moderate very fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine interstitial pores; few moderately thick clay films on faces of peds and many moderately thick clay films as bridges between mineral grains; 15 to 20 percent pebbles 1/2 to 3/4 inch in diameter; mildly alkaline; clear smooth boundary.

B21t 6 to 13 inches; reddish brown (5YR 5/4) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; moderate very fine subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine interstitial pores; few moderately thick clay films on faces of peds and common moderately thick clay films lining pores and as bridges between mineral grains; 25 to 30 percent pebbles 1/2 to 3/4 inch in diameter; mildly alkaline; gradual smooth boundary.

B22t 13 to 20 inches; reddish brown (5YR 5/4) gravelly sandy loam, reddish brown (5YR 4/4) moist; moderate medium angular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine interstitial pores; few moderately thick clay films on faces of peds and as bridges between mineral grains and common moderately thick clay films lining pores; 25 to 30 percent pebbles 1/2 to 3/4 inch in diameter; mildly alkaline; diffuse smooth boundary.

C1sica 20 to 39 inches; brown (7.5YR 5/4) very gravelly coarse sandy loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; discontinuous white (10YR 8/2) strongly silica-cemented lenses 1/2 to 3/4 inch wide and less than 1/8 inch thick; 35 to 50 percent pebbles 1/2 to 3/4 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C2sica 39 to 55 inches; white (10YR 8/2) very gravelly loamy coarse sand, very pale brown (10YR 7/3) moist; massive; extremely hard, extremely firm, nonsticky and nonplastic; discontinuous white (10YR 8/2) strongly silica-cemented lenses 1/2 to 3/4 inch wide and less than 1/8 inch thick; 35 to 50 percent pebbles 1/2 to 3/4 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline.

Thickness of the solum and depth to the nonindurated, strongly silica-cemented lenses, durinodes, or silica pendants on coarse fragments range from 20 to 40 inches. The profile is moderately saline-alkali or strongly saline-alkali throughout. The sodium adsorption ratio ranges from 13 to 35. The profile is mildly alkaline or moderately alkaline throughout. About 70 to 90 percent

of the surface layer is covered with a desert pavement of varnished pebbles and cobbles 3/8 inch to 8 inches in diameter.

The A horizon has color of 10YR 6/3, 6/4, or 7/4. The content of gravel ranges from 0 to 5 percent. The horizon is 2 to 4 inches thick.

The B2t horizon has color of 5YR 4/4, 5/4, or 5/6. In some pedons the color is 7.5YR 5/6. The content of gravel ranges from 10 to 35 percent.

The C horizon has color of 7.5YR 5/4 or 5/6 in the upper part, and the color is 10YR 7/4, 8/2, or 8/3 in the lower part. The content of gravel ranges from 35 to 65 percent. The duripan is not indurated in 1 or more layers of the C horizon. In some pedons it is made up of durinodes or silica coatings on rock fragments.

Kimberlina Series

The Kimberlina series consists of very deep, well drained soils on alluvial fans. Kimberlina soils formed in alluvium derived from mixed sources. Slopes range from 0 to 9 percent.

Soils of the Kimberlina series are coarse-loamy, mixed (calcareous), thermic Typic Torriorthents.

Typical pedon of Kimberlina loamy fine sand, cool, 0 to 2 percent slopes, 0.5 mile east on East End Road from the intersection of Camp Rock Road and Highway 247 and 50 feet south of road, in the NW1/4NW1/4NE1/4 of sec. 14, T. 4 N., R. 1 E., in the Cougar Buttes Quadrangle.

A1 0 to 7 inches; very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial pores; disseminated lime; violently effervescent; moderately alkaline; clear wavy boundary.

C1 7 to 23 inches; very pale brown (10YR 7/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and few fine roots; few very fine tubular pores and many very fine interstitial pores; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C2 23 to 35 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots; many very fine interstitial pores and few very fine tubular pores; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C3 35 to 51 inches; very pale brown (10YR 7/4) sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots; few fine interstitial pores and very fine tubular pores; disseminated lime and segregated lime in fine, slightly oblong filaments; violently effervescent; moderately alkaline; clear smooth boundary.

C4ca 51 to 60 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine interstitial pores and common very fine tubular pores; common fine 2- to 4-millimeter-thick gypsum crystals; disseminated lime and segregated lime in fine, irregularly shaped soft masses; violently effervescent; moderately alkaline.

In some areas 30 to 50 percent of the surface layer is covered by gravel and cobbles.

The A1 horizon has color of 10YR 6/3, 6/4, 7/3, or 7/4. It is loamy fine sand or gravelly sandy loam. The horizon is 6 to 10 inches thick.

The C horizon is loam, sandy loam, gravelly sandy loam, or fine sandy loam. In some pedons between depths of 30 and 45 inches, there is segregated lime in the form of fine to medium seams and soft masses in bands 2 to 4 inches thick.

The Kimberlina soils in this survey area are in a cool phase of the Kimberlina series. They are at a high elevation, and the average annual air temperature is at the low extreme of the defined range of characteristics for the series.

Lavic Series

The Lavic series consists of very deep, moderately well drained soils on alluvial fans and basin rims. Lavic soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 5 percent.

Soils of the Lavic series are coarse-loamy, mixed, thermic Typic Calciorthids.

Typical pedon of Lavic loamy fine sand, 3 miles west of Adelanto on El Mirage Road and about 50 feet southwest of the road, in the NE1/4NE1/4NE1/4 of sec. 24, T. 6 N., R. 6 W., in the Adelanto Quadrangle.

A1 0 to 10 inches; pale brown (10YR 6/3) loamy fine sand, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine interstitial pores; disseminated lime and segregated lime in few medium irregularly shaped white lime concretions; strongly effervescent; moderately alkaline; clear wavy boundary.

B2 10 to 20 inches; brown (7.5YR 5/4) loamy sand, dark brown (7.5YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; disseminated lime and segregated lime in few medium irregularly shaped white lime concretions; strongly

effervescent; moderately alkaline; abrupt wavy boundary.

C1ca 20 to 31 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; massive; weakly and discontinuously cemented with lime; very hard, friable, slightly sticky and slightly plastic; few very fine and medium roots; few very fine interstitial pores; disseminated lime and 20 percent segregated lime in hard white irregularly shaped concretions 1/2 to 3/4 inch in diameter and in large soft masses; violently effervescent; moderately alkaline; clear wavy boundary.

C2ca 31 to 40 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; massive; hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial pores; matrix is noncalcareous, but segregated lime is in few fine rounded soft masses; moderately alkaline; clear smooth boundary.

C3ca 40 to 49 inches; white (10YR 8/2) loam, light gray (10YR 7/2) moist; about 20 percent of matrix is light olive brown (2.5Y 5/4), light gray (10YR 7/2), and grayish brown (2.5Y 5/2) moist; massive; very hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine interstitial pores; matrix is noncalcareous, but 10 to 15 percent segregated lime is in large white irregularly shaped soft masses; moderately alkaline; clear smooth boundary.

C4 49 to 60 inches; light yellowish brown (10YR 6/4) loamy sand, yellowish brown (10YR 5/4) moist; massive; hard, very friable, nonsticky and nonplastic; no roots noted; many very fine interstitial pores and few fine tubular pores; matrix is noncalcareous, but segregated lime is in few medium irregularly shaped soft masses; moderately alkaline.

Depth to the calcic horizon ranges from 20 to 30 inches; the calcium carbonate equivalent ranges from 15 to 26 percent. The control section is loamy sand, loam, fine sandy loam, or loamy fine sand and is less than 18 percent clay.

The A1 horizon has color of 10YR 6/3, 7/3, or 7/4. The profile is mildly alkaline or moderately alkaline. The horizon is 5 to 10 inches thick.

The B2 horizon has color of 7.5YR 5/2, 5/4, or 6/4 or of 10YR 5/3.

The Cca horizon is massive or weakly cemented with lime, but it is not continuously cemented. The C4 horizon, to a depth of 60 inches or more, is loamy sand or very coarse sand.

Lovelace Series

The Lovelace series consists of very deep, well drained soils on alluvial fans. Lovelace soils formed in alluvium derived dominantly from granitic material. Slopes range from 5 to 9 percent.

Soils of the Lovelace series are sandy, mixed, thermic Typic Calciorthids.

Typical pedon of Lovelace loamy sand, 5 to 9 percent slopes, in Lucerne Valley, 1 mile east of Camp Rock Road on powerline access road, in the NE1/4SE1/4NE1/4 of sec. 26, T.5 N., R. 1 E., in the Cougar Buttes Quadrangle.

A1 0 to 6 inches; light brown (7.5YR 6/4) loamy sand, dark brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; 5 percent hard white lime concretions 1/8 inch in diameter; disseminated lime; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C1 6 to 19 inches; light brown (7.5YR 6/4) loamy sand, dark brown (7.5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; 10 percent hard white lime concretions 1/8 to 1/4 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C2ca 19 to 33 inches; white (10YR 8/1) loamy sand, light gray (10YR 7/1) moist; massive; very hard, firm, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; disseminated lime; violently effervescent; moderately alkaline; clear wavy boundary.

C3ca 33 to 49 inches; reddish yellow (7.5YR 6/6) sand, strong brown (7.5YR 5/6) moist; massive; very hard, firm, nonsticky and nonplastic; many very fine interstitial pores; 15 percent hard white irregularly shaped lime concretions 1 inch in diameter; disseminated lime; violently effervescent; moderately alkaline; clear wavy boundary.

C4 49 to 60 inches; light yellowish brown (10YR 6/4) sand, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; common very fine interstitial pores; moderately alkaline.

Depth to the calcic horizon ranges from 16 to 24 inches. The profile is mildly alkaline or moderately alkaline throughout.

The A1 horizon has color of 10YR 6/3, 6/4, 7/3, or 7/4 or of 7.5YR 6/4. It is 4 to 8 inches thick.

The C1 horizon has color of 10YR 5/3 or 6/3 or of 7.5YR 6/4. The C2ca and C3ca horizons generally are massive, but in some pedons they are very weakly cemented. They have 5 to 15 percent more calcium carbonate than the underlying horizon.

Lucerne Series

The Lucerne series consists of very deep, well drained soils on alluvial fans and terraces. Lucerne soils formed

in alluvium derived dominantly from granitic material. Slopes range from 0 to 5 percent.

Soils of the Lucerne series are coarse-loamy, mixed, thermic Xeralfic Haplargids.

Typical pedon of Lucerne sandy loam, 0 to 2 percent slopes, 100 feet north and 50 feet east of intersection of Seaforth Street and Windsor Avenue, in the NE1/4SE1/4NW1/4 of sec. 35, T. 4 N., R. 4 W., in the Hesperia Quadrangle.

A1 0 to 2 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 3/3) moist; weak very fine and fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 3 percent pebbles 1/16 to 3/16 inch in diameter; neutral; abrupt smooth boundary.

B1t 2 to 7 inches; light yellowish brown (10YR 6/4)sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores and few very fine tubular pores; many thin clay films as bridges between mineral grains; 3 percent pebbles 1/16 to 3/16 inch in diameter; neutral; clear smooth boundary.

B21t 7 to 22 inches; light yellowish brown (10YR 6/4) sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine and coarse roots; many very fine interstitial pores and few very fine tubular pores; common thin and few moderately thick clay films as bridges between mineral grains and few thin clay films lining pores; 3 percent pebbles 1/16 to 3/16 inch in diameter; neutral; gradual smooth boundary.

B22t 22 to 35 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine interstitial pores and common very fine tubular pores; common thin and moderately thick clay films as bridges between mineral grains and few thin clay films lining pores; 3 percent pebbles 1/16 to 3/16 inch in diameter; neutral; gradual smooth boundary.

B23t 35 to 62 inches; light yellowish brown (10YR 6/4) sandy loam, brown (7.5YR 4/4) moist; weak fine and medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine interstitial pores and common very fine tubular pores; clay films lining pores; pebbles 1/16 to 3/16 inch in diameter; neutral; clear wavy boundary.

B24tb 62 to 76 inches; reddish yellow (7.5YR 6/6) sandy loam, strong brown (7.5YR 5/6) moist; moderate medium and coarse angular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine interstitial pores and common very fine tubular pores; continuous moderately thick clay films as bridges between mineral grains and common moderately thick clay films lining pores; 5 percent pebbles 1/8 to 3/8 inch in diameter; neutral.

Thickness of the solum ranges from 40 to 80 inches. The content of gravel ranges from 0 to 15 percent throughout the profile. The profile is neutral or mildly alkaline throughout.

The A1 horizon has color of 10YR 6/3 or 6/4 or of 7.5YR 6/4. It is 2 to 4 inches thick. The B2t horizon has color of 7.5YR 5/4 or 6/4 or of 10YR 5/6.

Some pedons do not have a buried argillic horizon and have a gravelly sandy loam, sandy loam, or loamy sand C horizon.

Manet Series

The Manet series consists of very deep, well drained soils on alluvial fans. Manet soils formed in alluvium derived dominantly from dark-colored micaceous minerals. Slopes range from 0 to 9 percent.

Soils of the Manet series are sandy, mixed, thermic Typic Torrifluvents.

Typical pedon of Manet coarse sand, 2 to 5 percent slopes, 3.5 miles north and 6,300 feet east of the intersection of Johnson Road and Pearblossom Highway on the gasline maintenance road, 0.4 mile south on dirt road and 30 feet east of road, in the SE1/4SW1/4NW1/4 of sec. 5, T. 5 N., R. 6 W., in the Shadow Mountains in the Southeast Quadrangle.

A1 0 to 3 inches; light brownish gray (2.5Y 6/2) coarse sand, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; many very fine interstitial pores and few very fine tubular pores; moderately alkaline; gradual smooth boundary.

C1 3 to 19 inches; grayish brown (10YR 5/2) sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores and few very fine tubular pores; disseminated lime; violently effervescent; moderately alkaline; clear smooth boundary.

C2 19 to 42 inches; gray (10YR 6/1) loamy sand, dark gray (10YR 4/1) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots and few fine and medium roots; many very fine interstitial pores and few very fine tubular pores; thin strata of fine sandy loam; disseminated lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

C3 42 to 61 inches; gray (10YR 6/1) fine sandy loam, dark gray (10YR 4/1) moist; weak fine and medium angular blocky structure; slightly hard, very friable, nonsticky and slightly plastic; few very fine and fine roots; many very fine interstitial pores and few very fine tubular pores; thin strata of loamy fine sand; disseminated lime and segregated lime in few filaments or threads; strongly effervescent; moderately alkaline.

The percentage of organic carbon decreases irregularly as depth increases to 60 inches or more. The profile is nonsaline to slightly saline. The content of clay in the control section ranges from 3 to 8 percent, and the content of silt ranges from 20 to 28 percent; however, on a weighted average the soil in most pedons is loamy fine sand.

The A horizon has color of 10YR 5/2, 6/1, 6/2, 7/1, or 7/2 or of 2.5Y 6/2, 7/2, 6/0, or 7/0. It is cobbly coarse sand, coarse sand, loamy sand, or fine sandy loam. It is 1 inch to 12 inches thick.

The C horizon to a depth of 40 inches or more is dominantly loamy sand, loamy coarse sand, or sand and discontinuous strata of loamy fine sand, sandy loam, or fine sandy loam. Below a depth of 40 inches, to a depth of 60 inches or more, the C horizon is typically fine sandy loam, loam, or clay loam and strata of silty or sandy material.

Mirage Series

The Mirage series consists of very deep, well drained soils on old terraces that have a desert pavement. Mirage soils formed in alluvium derived dominantly from granitic material. Slopes range from 2 to 5 percent.

Soils of the Mirage series are fine-loamy, mixed, thermic Typic Haplargids.

Typical pedon of Mirage sandy loam, 2 to 5 percent slopes, on Stoddard Well Road, in the SE1/4NE1/4NE1/4 of sec. 34, T. 8 N., R. 2 W., in the Stoddard Well Quadrangle.

The soil surface has a developed desert pavement of pebbles and cobbles that have a desert varnish on exposed surfaces.

A1 0 to 3 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; weak thin platy structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common very fine vesicular and interstitial pores; 5 percent pebbles 1/4 to 3/8 inch in diameter; mildly alkaline; clear smooth boundary.

B1t 3 to 5 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky and nonplastic; common very fine roots; few very fine interstitial and tubular pores; many thin clay films as bridges between mineral grains; 5 percent pebbles 1/4 to 1/2 inch in diameter; mildly alkaline; gradual smooth boundary.

B2t 5 to 21 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate fine and medium angular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine interstitial and tubular pores; common thin clay films on faces of peds; many moderately thick clay films as bridges between mineral grains and lining some pores; 10 to 15 percent pebbles 1/4 to 1/2 inch in diameter; disseminated lime; slightly effervescent; mildly alkaline; gradual smooth boundary.

B3tca 21 to 39 inches; reddish yellow (7.5YR 6/6) gravelly sandy loam, strong brown (7.5YR 5/6) moist; moderate fine angular blocky structure; hard, friable, slightly sticky and nonplastic; many thin clay films as bridges between mineral grains; 30 percent pebbles 1/2 inch to 2 inches in diameter; disseminated lime and segregated lime in few fine and medium soft masses and filaments in lower part of horizon; strongly effervescent; moderately alkaline; gradual smooth boundary.

C1ca 39 to 60 inches; very pale brown (10YR 7/4) gravelly loamy sand, yellowish brown (10YR 5/4) moist; moderate medium platy structure; loose, very friable, nonsticky and nonplastic; 20 percent pebbles 1/2 to 1 inch in diameter; some pebbles have lime coating on bottom; disseminated lime; strongly effervescent; moderately alkaline.

The solum is 34 to 40 inches thick. The profile is mildly alkaline or moderately alkaline throughout. It is strongly saline-alkali. The sodium adsorption ratio ranges from 13 to 40. About 70 to 90 percent of the surface layer is covered by a desert pavement of weakly to strongly varnished gravel and cobbles 3/8 inch to 5 inches in diameter.

The A horizon has color of 10YR 6/4 or 7/4. The content of gravel ranges from 5 to 10 percent. The horizon is 3 to 6 inches thick.

The B2t horizon has color of 5YR 5/4, 5/6, or 6/6. It is sandy clay loam, gravelly sandy clay loam, or clay loam and averages 20 to 30 percent clay. The content of gravel ranges from 10 to 35 percent.

The C horizon has color of 10YR 6/4, 7/3, or 7/4. It is gravelly loamy sand to very gravelly sand. The content of gravel ranges from 20 to 50 percent.

Mohave Variant

The Mohave Variant consists of very deep, well drained soils on terraces. Mohave Variant soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 2 percent.

Soils of the Mohave Variant are fine-loamy, mixed, thermic Typic Haplargids.

Typical pedon of Mohave Variant loamy sand, 0 to 2 percent slopes, about 2,500 feet north of the southwest corner of section 10, in the NW1/4NW1/4SW1/4 of sec. 10, T. 8 N., R. 5 W., in the Adobe Mountain Quadrangle.

A1 0 to 7 inches; light brown (7.5YR 6/4) loamy sand, brown (7.5YR 4/4) moist; moderate very thick platy structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores and common very fine tubular pores; disseminated lime; strongly effervescent; moderately alkaline; abrupt smooth boundary.

B2t 7 to 13 inches; reddish yellow (7.5YR 7/6) sandy clay loam, strong brown (7.5YR 5/6) moist; moderate medium angular blocky structure; hard, firm, sticky and plastic; few medium roots; few very fine interstitial and tubular pores; few moderately thick clay films on faces of peds and common moderately thick clay films as bridges between mineral grains and lining pores; disseminated lime and segregated lime in few medium rounded soft masses; strongly effervescent; moderately alkaline; abrupt smooth boundary.

B3tca 13 to 17 inches; pink (7.5YR 7/4) sandy clay loam, brown (7.5YR 5/4) moist; weak medium angular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine interstitial and tubular pores; many moderately thick clay films as bridges between mineral grains; disseminated lime and segregated lime in many medium irregularly shaped soft masses; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1ca 17 to 26 inches; white (10YR 8/2) sandy clay loam, very pale brown (10YR 7/4) moist; massive; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; disseminated lime and segregated lime in few medium rounded concretions; violently effervescent; moderately alkaline; gradual wavy boundary.

C2 26 to 40 inches; very pale brown (10YR 8/3) loamy sand, light yellowish brown (10YR 6/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular pores; disseminated lime and segregated lime in few fine rounded concretions; strongly effervescent; moderately alkaline; gradual wavy boundary.

C3 40 to 60 inches; very pale brown (10YR 8/4) loamy sand, very pale brown (I0YR 7/4) moist; massive; slightly hard, firm, nonsticky and nonplastic; few very fine roots; few very fine tubular pores; some strata silica-cemented; disseminated lime and segregated lime in few fine rounded concretions; strongly effervescent; strongly alkaline.

The solum is 14 to 20 inches thick. Depth to a calcic horizon ranges from 13 to 20 inches. The calcium carbonate equivalent of the calcic horizon ranges from 25 to 30 percent.

The A horizon has color of 7.5YR 4/4, 6/4, or 7/4 or of 10YR 7/3 or 7/4). It is 4 to 8 inches thick. The B2t horizon has color of 7.5YR 6/6 or 7/7 or of 5YR 5/4.

This Mohave Variant soil is similar to soils in the Mohave series except that the solum is 14 to 20 inches thick instead of 20 to 60 inches thick, which is normal for soils in the Mohave series.

Nebona Series

The Nebona series consists of shallow, well drained soils on terraces. Nebona soils formed in alluvium derived from mixed sources. Slopes range from 2 to 9 percent.

Soils of the Nebona series are loamy, mixed, thermic, shallow Typic Durorthids.

Typical pedon of Nebona sandy loam, in an area of Nebona-Cuddeback complex, 2 to 9 percent slopes, northwest of Victorville on Interstate 15, west of the Hodge Road turnoff, and about 2.5 miles northeast of intersection of Hodge Road and gasline maintenance road, about 1,500 feet north and 100 feet west of the southeast corner of section 11, in the SE1/4SE1/4SE1/4 of sec. 11, T. 8 N., R. 3 W., in the Hodge Quadrangle.

The soil surface is covered by a desert pavement of pebbles and cobbles that have a desert varnish on some exposed surfaces.

A1 0 to 2 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; moderate very thin and thin platy structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; common very fine interstitial pores and few very fine vesicular pores; 5 percent pebbles 1/2 to 3/4 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1ca 2 to 8 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; moderate fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few fine medium and coarse roots; few very fine interstitial and tubular pores; few thin clay films as bridges between mineral grains; 10 percent pebbles 1/4 to 1 inch in diameter and 3 percent cobbles; disseminated lime; violently effervescent; moderately alkaline; abrupt wavy boundary.

C2sicam 8 to 12 inches; white (10YR 8/2), very hard, indurated, continuous, massive silica pan, very pale brown (10YR7/3) moist; few very fine roots on top of pan; clear wavy boundary.

C3sica 12 to 29 inches; very pale brown (10YR 7/3) gravelly sand, brownish yellow (10YR 6/6) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots and few coarse roots; few very fine

interstitial pores; one or two discontinuous silica-cemented lenses 1/2 inch thick; 30 percent pebbles 1/4 inch to 1 1/2 inches in diameter; disseminated lime and segregated lime in few fine soft masses; violently effervescent; moderately alkaline; clear wavy boundary.

C4ca 29 to 44 inches; very pale brown (10YR 8/3) gravelly loamy sand, yellow (10YR 7/6) moist; moderate medium and coarse subangular blocky structure; slightly hard to soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine interstitial pores; 30 percent pebbles 1/4 to 1/2 inch in diameter; disseminated lime and segregated lime in few fine soft masses; violently effervescent; moderately alkaline; clear wavy boundary.

C5 44 to 65 inches; yellow (10YR 7/6) sandy loam, yellowish brown (10YR 5/6) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial pores; disseminated lime; slightly effervescent; strongly alkaline.

Depth to the duripan ranges from 6 to 14 inches. The material underlying the A horizon is slightly saline to strongly saline and is high in content of alkali. The sodium adsorption ratio is more than 13 in the material underlying the A horizon. About 40 to 60 percent of the surface is covered by a desert pavement of nonvarnished to strongly varnished pebbles and cobbles 3/8 inch to 5 inches in diameter.

The A horizon has color of 10YR 6/3, 6/4, 7/3, or 7/4. The content of gravel ranges from 5 to 10 percent. The horizon is 2 to 4 inches thick. It is mildly alkaline or moderately alkaline.

The upper part of the C horizon is sandy loam or fine sandy loam. The content of gravel ranges from 5 to 15 percent. In some pedons there is a thin B2 horizon over the duripan. The duripan is 4 to 26 inches thick. It has opal caps in some areas. The horizons underlying the duripan are characteristically variable and range from gravelly loamy sand to loam.

Norob Series

The Norob series consists of very deep, well drained soils on terraces. Norob soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 5 percent.

Soils of the Norob series are fine-loamy, mixed, thermic Typic Natrargids.

Typical pedon of Norob loamy sand, in an area of Norob-Halloran complex, 0 to 5 percent slopes, 2.7 miles east and 1.7 miles south of intersection of Santa Fe Avenue and Harper Lake Road, in the SW1/4SE1/4SE1/4SW1/4 of sec. 3, T. 10 N., R. 4 W., in the Twelve Gauge Lake Quadrangle.

A1 0 to 5 inches; light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; neutral; abrupt wavy boundary.

B21t 5 to 9 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; strong very coarse columnar structure parting to strong medium and coarse angular blocky; gray (10YR 6/1) caps 1/4 inch thick on tops of columns; hard, friable, sticky and very plastic; common very fine roots; common very fine tubular pores; many moderately thick clay films on faces of peds and common thick clay films on bridges between mineral grains and lining pores; strongly alkaline; abrupt wavy boundary.

B22tca 9 to 17 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 5/3) moist; moderate very coarse columnar structure parting to moderate medium and coarse subangular blocky; hard, friable, sticky and plastic; few very fine roots; common very fine interstitial pores and many very fine tubular pores; common moderately thick clay films on faces of peds, as bridges between mineral grains, and lining pores; disseminated lime and segregated lime in common medium soft masses; violently effervescent; strongly alkaline; abrupt wavy boundary.

B3tca 17 to 33 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; strong fine and medium subangular blocky structure; hard, very friable, sticky and plastic; few very fine roots; many very fine tubular pores; many thin clay films on faces of peds, few moderately thick clay films as bridges between mineral grains and lining pores; disseminated lime and segregated lime in common medium soft masses and seams; violently effervescent; strongly alkaline; clear wavy boundary.

IIC1ca 33 to 55 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores and few very fine tubular pores; disseminated lime and segregated lime in few fine seams; violently effervescent; moderately alkaline; clear wavy boundary.

IIIC2 55 to 67 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; violently effervescent; moderately alkaline.

The solum is 32 to 50 inches thick. Electrical conductivity in the natric horizon ranges from 2 to 14 millimhos per centimeter, and the sodium adsorption ratio ranges from 15 to 100.

The A1 horizon has color of 10YR 6/4, 7/3, or 7/4. It is neutral to moderately alkaline. It is 4 to 8 inches thick.

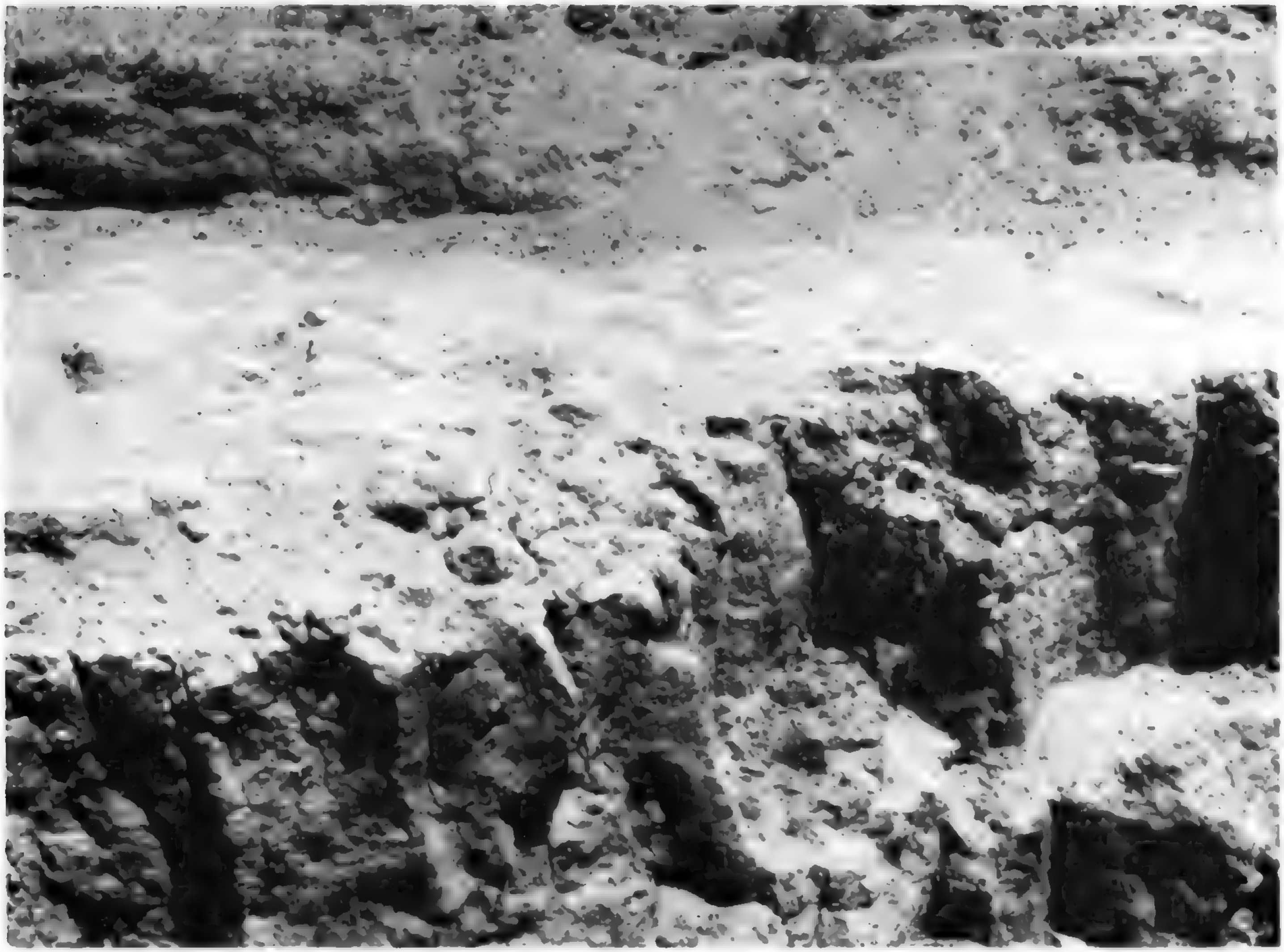

Figure 18. Profile of a Norob soil. The surface layer has been removed to show the gray caps on top of the columns in the natric horizon.

The B2t horizon has color of 7.5YR 4/4, 5/4, or 5/6 or of 10YR 5/3 or 6/4. It typically has dark gray or gray (10YR 4/1 or 6/1) caps 1/4 to 1 inch thick on the tops of columns (fig. 18). The profile is moderately alkaline or strongly alkaline. In some pedons lime is segregated in few fine or medium soft lime masses in the lower parts of the columns.

The C horizon has color of 10YR 6/3, 7/2, 7/3, or 8/4. It is loamy sand, sandy loam, fine sandy loam, sand, gravelly sand, or sandy clay loam. Lime is segregated in few or common fine or medium soft masses and seams.

Oak Glen Series

The Oak Glen series consists of very deep, well drained soils on upper alluvial fans. Oak Glen soils formed in alluvium derived dominantly from granitic material. Slopes range from 2 to 9 percent.

Soils of the Oak Glen series are coarse-loamy, mixed, mesic Pachic Haploxerolls.

Typical pedon of Oak Glen sandy loam, in an area of Avawatz-Oak Glen association, gently sloping, 1.9 miles northeast of the intersection of Highway 138 and Highway 173 and 100 feet east of Goat Trail Road, on Los Flores Ranch, in the NE1/4NW1/4NE1/4 of sec. 29, T. 3 N., R. 4 W., in the Silverwood Lake Quadrangle.

A1 0 to 22 inches; gray (10YR 5/1) sandy loam, very dark gray (10YR 3/1) moist; weak very fine subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; few very fine, fine, and medium roots; common very fine and few fine

interstitial pores and common very fine tubular pores; 5 percent pebbles 1/4 to 3/8 inch in diameter; slightly acid; gradual smooth boundary.

AC 22 to 38 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, nonsticky and slightly plastic; few very fine and fine roots; common very fine and few fine interstitial pores; common very fine tubular pores; 5 percent pebbles 1/2 to 3/4 inch in diameter; slightly acid; gradual smooth boundary.

C1 38 to 60 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; massive; hard, friable, nonsticky and slightly plastic; few fine roots; few very fine interstitial and tubular pores; 5 percent pebbles 3/4 to 1 inch in diameter; slightly acid.

The profile is slightly acid or neutral throughout. Base saturation is 75 to 95 percent, and content of organic carbon is more than 0.6 percent at a depth of 20 to 30 inches or more.

The A1 horizon has color of 10YR 4/1, 4/2, 4/3, 5/1, or 5/2. The content of gravel ranges from 5 to 10 percent. The horizon is 20 to 28 inches thick.

The C horizon has color of 10YR 5/2, 5/3, or 6/4. The content of gravel ranges from 5 to 15 percent.

Peterman Series

The Peterman series consists of very deep, moderately well drained soils on the lower margins of alluvial fans and basin rims. Peterman soils formed in fine-textured alluvium derived from mixed sources. Slopes range from 0 to 2 percent.

Soils of the Peterman series are fine, mixed, thermic Typic Calciorthids.

Typical pedon of Peterman clay, about 3 miles north of Lucerne Valley and 1.4 miles east of Highway 247, in the NE1/4SE1/4SW1/4 of sec. 30, T. 5 N., R. 1 E., in the Lucerne Valley Quadrangle.

Ap 0 to 5 inches; very pale brown (10YR 7/3) clay, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many very fine vesicular and interstitial pores; disseminated lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1ca 5 to 22 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine vesicular pores; disseminated lime and segregated lime in common fine and medium rounded hard white concretions and soft masses; violently effervescent; moderately alkaline; gradual smooth boundary.

C2ca 22 to 37 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; strong fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine vesicular pores and few very fine tubular pores; disseminated lime and segregated lime in common medium to large soft white rounded masses and hard white irregularly shaped concretions; violently effervescent; strongly alkaline; diffuse smooth boundary.

C3ca 37 to 55 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; strong fine and medium subangular blocky structure; hard, friable, sticky and plastic; no roots; common very fine tubular and vesicular pores; disseminated lime and segregated lime in common medium to large soft white rounded masses and hard white irregularly shaped concretions; violently effervescent; strongly alkaline; clear smooth boundary.

C4 55 to 60 inches; very pale brown (10YR 7/4) clay, yellowish brown (10YR 5/4) moist; moderate medium and coarse angular blocky structure; very hard, friable, sticky and plastic; common very fine vesicular and few fine tubular pores; disseminated lime and segregated lime in few to common fine soft white rounded masses and hard white irregularly shaped concretions; violently effervescent; very strongly alkaline.

Depth to a calcic horizon that includes soft lime masses and hard lime concretions ranges from 5 to 30 inches. The calcic horizon ranges from 24 to 50 inches in thickness but typically is about 36 inches thick. The calcium carbonate equivalent ranges from 15 to 30 percent. Gypsum is present in varying amounts in most pedons. These soils are moderately saline-alkali or strongly saline-alkali throughout.

The A horizon has color of 10YR 6/3, 7/3, or 7/4. It is clay or loam. The profile is moderately alkaline or strongly alkaline. It is 5 to 10 inches thick.

The C horizon has color of 10YR 6/3 or 7/4. It is 3 to 30 percent lime that is segregated in fine to large, hard, white, irregularly shaped concretions and soft masses. It is moderately alkaline to very strongly alkaline. The content of disseminated and segregated lime in the part of the C horizon underlying the Cca horizon is more than 5 percent less than that in the Cca horizon.

Rosamond Series

The Rosamond series consists of very deep, well drained soils on alluvial fans and basin rims. Rosamond soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 2 percent.

Soils of the Rosamond series are fine-loamy, mixed (calcareous), thermic Typic Torrifluvents.

Typical pedon of Rosamond loam, saline-alkali, about 2,500 feet west and 100 feet north of the southeast corner of section 1, in the SE1/4SE1/4SW1/4 of sec. 1, T. 6 N., R. 6 W., in the Victorville Northwest Quadrangle.

A1 0 to 5 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; strong thin, medium, and thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine interstitial and vesicular pores; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.
C1 5 to 14 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and plastic; few very fine roots; many very fine tubular pores; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.
C2 14 to 44 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; many fine tubular pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.
IIC3 44 to 54 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine tubular pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.
IIC4 54 to 60 inches; very pale brown (10YR 7/3) loamy sand, pale brown (10YR 6/3) moist; single grain; loose, nonsticky and nonplastic; common very fine interstitial pores; disseminated lime; slightly effervescent; moderately alkaline.

The percentage of organic carbon decreases irregularly as depth increases. The profile is moderately saline-alkali to strongly saline-alkali throughout.

The A horizon has color of 10YR 5/3, 6/3, or 6/4. It is mildly alkaline or moderately alkaline. The horizon is 5 to 10 inches thick.

The part of the C horizon in the control section is clay loam or loam. The content of clay is 18 to 35 percent. The lower parts of the C horizon, at a depth of about 44 to 60 inches, are loamy sand, loamy fine sand, and loamy coarse sand. In some pedons the C horizon is stratified loam to silty clay loam below a depth of about 40 inches.

Sheephead Series

The Sheephead series consists of shallow, somewhat excessively drained soils on mountains. Sheephead soils formed in residuum of granitic rock. Slopes range from 15 to 30 percent.

Soils of the Sheephead series are loamy, mixed, mesic, shallow Entic Ultic Haploxerolls.

Typical pedon of Sheephead gravelly sandy loam, in an area of Crafton-Sheephead-Rock outcrop association, steep, on Grapevine Canyon Road, 0.6 mile north of the San Bernardino National Forest boundary and 100 feet west of the road, in the NW1/4NW1/4SE1/4 of sec. 2, T. 3 N., R. 2 W., in the Fifteenmile Valley Quadrangle.

A1 0 to 14 inches; grayish brown (10YR 5/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; few very fine interstitial pores; 20 percent pebbles 1/2 inch in diameter; slightly acid; gradual smooth boundary.
C1 14 to 18 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak very fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and few fine roots; few very fine interstitial pores; 20 percent pebbles 3/4 to 1 inch in diameter; slightly acid; clear smooth boundary.
C2r 18 inches; weathered granitic rock.

Depth to contact with weathered granitic rock ranges from 15 to 20 inches. The A1 horizon has color of 10YR 4/3, 5/2, or 5/3. The content of gravel ranges from 15 to 20 percent. Base saturation ranges from 70 to 75 percent throughout the A horizon. The A horizon is 10 to 16 inches thick. The C horizon has color of 10YR 5/2, 5/3, or 6/3. The content of gravel ranges from 15 to 25 percent. In some pedons there is no C horizon.

Soboba Series

The Soboba series consists of very deep, excessively drained soils on alluvial fans. Soboba soils formed in alluvium derived dominantly from granitic material. Slopes range from 2 to 9 percent.

Soils of the Soboba series are sandy-skeletal, mixed, thermic Typic Xerofluvents.

Typical pedon of Soboba gravelly sand, cool, 2 to 9 percent slopes, about 2,600 feet south and 1,100 feet west of the intersection of Smoke Tree Road and Silver Rock Road, in the NW1/4NE1/4SW1/4 of sec. 16, T. 4 N., R. 7 W., in the Phelan Quadrangle.

A1 0 to 4 inches; grayish brown (10YR 5/2) gravelly sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; very few very fine roots; many very fine and fine and common medium and coarse interstitial pores; 30 percent pebbles 1/2 to 1 inch in diameter; slightly acid; abrupt smooth boundary.
C1 4 to 16 inches; grayish brown (10YR 5/2) very gravelly sand, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many medium and coarse interstitial pores and few very fine tubular pores; 65 percent

pebbles 1 inch in diameter; neutral; gradual smooth boundary.

C2 16 to 60 inches; grayish brown (2.5Y 5/2) very gravelly sand, olive brown (2.5Y 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many fine, medium, and coarse interstitial pores; 50 percent pebbles 1/2 to 1 inch in diameter; mildly alkaline.

The A1 horizon has color of 10YR 5/2 or 2.5Y 5/2. The content of gravel and cobbles ranges from 20 to 35 percent. The horizon is slightly acid or neutral. It is 4 to 10 inches thick.

The C horizon has color of 10YR 5/2 or 5/3 or of 2.5Y 5/2. It is very gravelly loamy sand to very gravelly sand. The content of gravel and cobbles ranges from 35 to 65 percent. The horizon is slightly acid to mildly alkaline.

Soboba soils in the survey area are in a cool phase of the Soboba series. They are at a high elevation, and the average annual air temperature is at the low extreme of the defined range of characteristics for the series.

Sparkhule Series

The Sparkhule series consists of shallow, well drained soils on upland foothills. Sparkhule soils formed in residuum of volcanic rock. Slopes range from 15 to 50 percent.

Soils of the Sparkhule series are loamy, mixed, thermic Lithic Haplargids.

Typical pedon of Sparkhule gravelly sandy loam, in an area of Sparkhule-Rock outcrop complex, 15 to 50 percent slopes, about 2.5 miles northeast of Interstate 15 and Boulder Road on powerline right-of-way, in the SE1/4SE1/4NW1/4 of sec. 13, T. 7 N., R. 3 W., in the Turtle Valley Quadrangle.

A1 0 to 2 inches; very pale brown (10YR 7/3) gravelly sandy loam, brown (10YR 5/3) moist; very fine subangular blocky structure, upper 1/2 inch is massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine interstitial pores; 20 percent pebbles 1/2 to 1 inch in diameter; mildly alkaline; clear smooth boundary.

B21t 2 to 8 inches; reddish yellow (7.5YR 6/6) gravelly sandy clay loam, strong brown (7.5YR 5/6) moist; strong fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine interstitial and tubular pores; common thin clay films on faces of peds and as bridges between mineral grains; 20 percent pebbles 1/2 to 3/4 inch in diameter; mildly alkaline; gradual wavy boundary.

B22t 8 to 14 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; moderate fine prismatic structure; hard, friable, sticky and plastic; few very fine and medium roots; few very fine interstitial and tubular pores; common moderately thick clay films on faces of peds and many moderately thick clay films as bridges between mineral grains and lining pores; 10 percent pebbles 1/4 to 1/2 inch in diameter; neutral; gradual wavy boundary.

B3t 14 to 18 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam, brown (7.5YR 4/4) moist; moderate very fine and fine angular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine interstitial pores; few thin clay films on faces of peds; common thin clay films as bridges between mineral grains and lining pores; 25 percent pebbles 1/2 to 1 inch in diameter; neutral; abrupt wavy boundary.

R 18 inches; hard, shattered, dark gray dacite.

Depth to lithic contact ranges from 14 to 20 inches.

The A1 horizon has color of 10YR 5/3, 6/4, 6/6, or 7/3 or of 7.5YR 6/6, 6/8, or 7/4. The content of gravel ranges from 15 to 25 percent. The A1 horizon is 2 to 3 inches thick.

The B2t horizon has color of 7.5YR 6/6 or 5YR 4/6, 5/6, or 6/4. It is sandy clay loam, gravelly sandy clay loam, or gravelly clay loam. The content of rock fragments ranges from 10 to 30 percent. Absolute increase of clay in the upper 3 inches of the B horizon is l5 to 20 percent more than that in the A horizon. In some pedons there is no B3t horizon.

Trigger Series

The Trigger series consists of shallow, well drained soils on upland terraces and foothills. Trigger soils formed in residuum of hard sedimentary and metasedimentary rock. Slopes range from 5 to 50 percent.

Soils of the Trigger series are loamy, mixed (calcareous), thermic Lithic Torriorthents.

Typical pedon of Trigger gravelly sandy loam, in an area of Trigger-Rock outcrop complex, 30 to 50 percent slopes, about 1,200 feet east and 100 feet south of the west corner of section 6, in the NW1/4NW1/4NW1/4 of sec. 6, T. 6 N., R. 5 W., in the Victorville Northwest Quadrangle.

A1 0 to 12 inches; very pale brown (10YR 7/3) gravelly sandy loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; few very fine interstitial and tubular pores; 25 percent pebbles 1/2 to 3/4 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

R1 12 to 19 inches; hard fractured rock that has sandy loam in fracture joints; upper 3 to 4 inches is slightly weathered in a few places; common very fine roots

in fracture joints; disseminated lime; violently effervescent; gradual irregular boundary.

R2 19 inches; hard blue-gray limestone that has few seams of pinkish-white quartzite.

Depth to contact with hard lime-cemented conglomerate or hard sedimentary and metasedimentary rock ranges from 10 to 18 inches. The A horizon has color of 10YR 6/3, 7/3, or 7/4. It is gravelly sandy loam or gravelly loam. The content of gravel ranges from 15 to 35 percent. The A horizon is 10 to 18 inches thick. The R1 horizon is hard fractured rock that has sandy loam or loam in fracture joints.

Tujunga Series

The Tujunga series consists of very deep, somewhat excessively drained soils on alluvial fans. Tujunga soils formed in alluvium derived dominantly from granitic material. Slopes range from 2 to 9 percent.

Soils of the Tujunga series are mixed, thermic Typic Xeropsamments.

Typical pedon of Tujunga sand, cool, 2 to 9 percent slopes, about 1,100 feet east and 2,800 feet north of the intersection of Silver Rock Road and Phelan Road, in the SE1/4SW1/4NE1/4 of sec. 16, T. 4 N., R. 7 W., in the Phelan Quadrangle.

A1 0 to 3 inches; light brownish gray (10YR 6/2) sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; common very fine interstitial pores; 15 percent pebbles 1/2 inch in diameter; slightly acid; abrupt smooth boundary.

C1 3 to 7 inches; light brownish gray (10YR 6/2) sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots and few fine and medium roots; common very fine interstitial pores; 10 percent pebbles 1/4 inch in diameter; neutral; clear wavy boundary.

C2 7 to 14 inches; brown (10YR 5/3) sand, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots and few fine and medium roots; common very fine interstitial pores; 10 percent pebbles 1/4 to 3/8 inch in diameter; neutral; gradual smooth boundary.

C3 14 to 30 inches; brown (10YR 5/3) gravelly sand, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; many very fine and fine interstitial pores; 20 percent pebbles 1/4 to 1 inch in diameter; neutral; gradual smooth boundary.

C4 30 to 36 inches; brown (10YR 5/3) gravelly sand, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine interstitial pores; 15 percent pebbles 1/2 inch in diameter; neutral; gradual smooth boundary.

C5 36 to 44 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine interstitial pores; 5 percent pebbles 1/4 inch in diameter; neutral; gradual smooth boundary.

C6 44 to 60 inches; pale brown (10YR 6/3) sand, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine interstitial pores; 5 percent pebbles 1/4 to 1/2 inch in diameter; mildly alkaline.

The content of gravel ranges from 0 to 25 percent throughout the profile. The A1 horizon has color of 10YR 5/2, 5/3, 6/2, or 6/3. The horizon is slightly acid or neutral. It is 3 to 6 inches thick. The C horizon is sand or gravelly sand.

The Tujunga soils in this survey area are in a cool phase of the Tujunga series. They are at high elevations, and the average annual air temperature is at the low extreme of the defined range of characteristics for the series.

Victorville Series

The Victorville series consists of very deep, moderately well drained soils on low river terraces and, in some areas, on flood plains. Victorville soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 2 percent.

Soils of the Victorville series are coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents.

Typical pedon of Victorville sandy loam, about 1,500 feet south and 3,200 feet east of the intersection of Interstate 15 and Highway 18, in the SW1/4NE1/4NW1/4 of sec. 10, T. 5 N., R. 4 W., in the Victorville Quadrangle.

Ap1 0 to 8 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; hard, firm, nonsticky and nonplastic; common very fine roots and few fine and medium roots; few very fine interstitial pores and few fine tubular pores; 4 percent pebbles 1/16 to 1/8 inch in diameter; disseminated lime; slightly effervescent; mildly alkaline; abrupt smooth boundary.

A12 8 to 16 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine, fine, and medium roots; few very fine interstitial pores and few fine and medium tubular pores; 6 percent pebbles 1/8 to 1/4 inch in diameter; disseminated lime; slightly effervescent; mildly alkaline; abrupt smooth boundary.

C1ca 16 to 35 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2)

moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial and tubular pores; few oblique and discontinuous lenses of loamy sand and gravelly sand 1 to 2 inches thick; 4 percent pebbles 1/16 to 1/8 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C2 35 to 45 inches; variegated gray (10YR 5/1) loamy sand, very dark gray (10YR 3/1) and dark brown (10YR 4/3) moist; about 80 percent includes few fine distinct brown (7.5YR 4/4) mottles; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few thin lenses of sandy loam that is dark grayish brown (10YR 4/2) when moist; organic carbon streaks 2 to 4 millimeters thick; mildly alkaline; abrupt smooth boundary.

C3 45 to 49 inches; very pale brown (10YR 7/3) sand, brown (10YR 5/3) moist; common fine distinct reddish yellow (7.5YR 6/8) mottles; single grain; loose, nonsticky and nonplastic; neutral; abrupt smooth boundary.

IIC4 49 to 60 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; medium distinct yellowish red (5YR 4/6) mottles; massive; hard, firm, sticky and plastic; thin lenses of loam and sandy loam 2 to 4 millimeters thick; stains and organic carbon streaks; disseminated lime; slightly effervescent; mildly alkaline.

The percentage of organic carbon decreases irregularly as depth increases to 60 inches or more. Content of organic carbon ranges from 0.6 to 1.2 percent to a depth of 10 inches or more. The content of gravel ranges from 0 to 15 percent throughout.

The A1 horizon has color of 10YR 4/3, 5/2, or 5/3. The profile is neutral or mildly alkaline and is 8 to 16 inches thick.

The C horizon in the control section generally is 10YR 5/1, 5/2, 6/2, 6/3, 6/4, 7/4, 7/6, 8/4, or 8/6. It is dominantly sandy loam or fine sandy loam and includes thin strata of loamy sand, sand, or gravelly sand. Strata of loam or clay loam that are mottled and have organic carbon streaks are at a depth of 49 to 60 inches. Generally, there are mottles below a depth of 30 inches. The C horizon is neutral to moderately alkaline.

Victorville Variant

The Victorville Variant consists of very deep, well drained soils on the lower margins of alluvial fans and in small basins. Victorville Variant soils formed in alluvium derived from mixed sources. Slopes range from 0 to 2 percent.

Victorville Variant soils are coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents.

Typical pedon of Victorville Variant sand, 0. 8 mile north of intersection of U.S. Highway 58 and Lenwood Road and 100 feet west of road, in the SE1/4NE1/4NE1/4 of sec. 30, T. 10 N., R. 2 W., in the Barstow Quadrangle.

C1 0 to 5 inches; light yellowish brown (10YR 6/4) sand, yellowish brown (10YR 5/4) moist; weak very thin and thin platy structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial pores and few fine tubular pores; 5 percent pebbles 1/8 to 1/4 inch in diameter; disseminated lime; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C2 5 to 8 inches; pale brown (10YR 6/3) loamy fine sand, dark brown (10YR 4/3) moist; moderate thin and medium platy structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial pores and common very fine and fine tubular pores; disseminated lime; violently effervescent; moderately alkaline; abrupt wavy boundary.

C3 8 to 12 inches; light yellowish brown (10YR 6/4) sand, yellowish brown (10YR 5/4) moist; weak thin and medium platy structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine and few fine interstitial pores; 5 percent pebbles 1/8 to 1 inch in diameter; disseminated lime; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C4 12 to 18 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; weak fine and medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial pores and many very fine tubular pores; 5 percent pebbles 1/8 to 3/4 inch in diameter; segregated lime in common fine soft masses and seams; moderately alkaline; abrupt wavy boundary.

C5 18 to 24 inches; pale brown (10YR 6/3) coarse sandy loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; common very fine and few fine roots; many very fine interstitial pores and few very fine tubular pores; 12 percent pebbles 1/8 to 1 inch in diameter; disseminated lime and segregated lime in common fine soft masses and seams; slightly effervescent; strongly alkaline; gradual smooth boundary.

C6 24 to 42 inches; yellowish brown (10YR 5/4) gravelly loamy coarse sand, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; common very fine and few fine interstitial pores; 20 percent pebbles 1/8 to 1 inch in diameter; many thin 1/8- to 1/4-inch-thick strata of sandy loam; disseminated lime and segregated lime in common medium concretions; strongly effervescent; strongly alkaline; abrupt wavy boundary.

C7 42 to 60 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine interstitial pores; 5 percent pebbles 1/8 to 1/4 inch in diameter; disseminated lime and segregated lime in common fine soft seams; strongly effervescent; strongly alkaline.

The percentage of organic carbon decreases irregularly as depth increases to a depth of 60 inches or more. The profile is moderately alkaline or strongly alkaline throughout. It is moderately saline-alkali to a depth of 40 inches and is slightly saline-alkali below that. The C1 horizon has color of 10YR 6/3, 6/4, or 7/3. It is 5 to 10 inches thick. The part of the C horizon in the control section has color of 10YR 5/4, 6/3, 6/4, or 7/3 or of 7.5YR 5/4. It is coarsely stratified with lenses of sandy clay loam, sandy loam, sand, and gravelly loamy coarse sand. Average content of clay ranges from 8 to 12 percent, and average content of gravel is 5 to 15 percent. Individual layers are 0 to 20 percent gravel. The part of the C horizon below the control section, to a depth of 60 inches, is loamy fine sand, loamy sand, or sand.

The Victorville Variant soils in this survey area are similar to the soils in the Victorville series except that they have a light-colored ochric epipedon and have 8 to 12 percent clay in the control section. The soils in the Victorville series have mollic colors in the epipedon and have 12 to 18 percent clay in the control section.

Villa Series

The Villa series consists of very deep, moderately well drained soils on flood plains and on some low river terraces. Villa soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 2 percent.

Soils of the Villa series are sandy, mixed, thermic Typic Torrifluvents.

Typical pedon of Villa loamy sand, on Starbuck Ranch, about 1,700 feet south and 2,600 feet west of intersection of Indian Trail Road and Wild Road, 100 feet east of the old corral fence, in the NW1/4SE1/4NW1/4 of sec. 15, T. 8 N., R. 4 W., in the Wild Crossing Quadrangle.

Ap 0 to 7 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; moderate medium angular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; few very fine interstitial and tubular pores; mildly alkaline; abrupt smooth boundary.

C1 7 to 22 inches; light brownish gray (10YR 6/2) loamy sand, grayish brown (10YR 5/2) moist; moderate medium platy structure; soft, loose, nonsticky and nonplastic; common very fine roots; few very fine interstitial and tubular pores; lower part of horizon has thin lenses of sand and many 2- to 4-millimeter-thick lenses of sandy loam that is dark brown (10YR 4/3) when moist; disseminated lime; slightly effervescent; mildly alkaline; abrupt smooth boundary.

C2 22 to 44 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; moderate medium platy structure; soft, loose, nonsticky and nonplastic; few very fine roots; few very fine tubular pores; in upper part of horizon, two or three 10- to 40-millimeter-thick lenses of sandy loam that is dark brown (10YR3/3) when moist; in lower part of horizon, four 50- to 100-millimeter-thick lenses of sandy loam that is dark brown (10YR 3/3) when moist; disseminated lime; slightly effervescent; mildly alkaline; abrupt smooth boundary.

C3 44 to 56 inches; light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular pores; four 2- to 5-millimeter-thick lenses of sandy loam that is dark brown (10YR 3/3) when moist; organic carbon material, which stains fingers, between lenses; 3 to 5 percent pebbles 1/4 to 3/8 inch in diameter; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C4 56 to 60 inches; dark grayish brown (10YR 4/2) loamy sand, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine tubular pores; mildly alkaline.

The percentage of organic carbon decreases irregularly as depth increases to 60 inches or more.

The Ap or A1 horizon has color of 10YR 6/2, 6/3, 6/4, 7/3, or 7/4. It is 0 to 12 inches thick.

The C horizon to a depth of about 40 inches is sandy loam, loamy fine sand, loamy sand, or sand. It has thin strata of dark brown (10YR 4/3, moist) sandy loam; bands of organic carbon 1 to 2 millimeters thick separate the strata between depths of 20 and 40 inches. The content of gravel ranges from 0 to 10 percent. Below a depth of 40 inches, the C horizon is sandy loam, loamy fine sand, loamy sand, or sand. In some pedons mottles range from few to common, fine to medium, and faint to distinct below a depth of 36 to 40 inches. Depth to a high water table is 3 to 6 feet from December through April.

Wasco Series

The Wasco series consists of very deep, well drained soils on alluvial fans. Wasco soils formed in alluvium derived dominantly from granitic material. Slopes range from 0 to 5 percent.

Soils of the Wasco series are coarse-loamy, mixed, nonacid, thermic Typic Torriorthents.

Typical pedon of Wasco sandy loam, cool, 0 to 2 percent slopes, about 0.5 mile east of Milpas Road, in the NE1/4NE1/4SW1/4 of sec. 9, T. 4 N., R. 2 W., in the Fifteenmile Valley Quadrangle.

A1 0 to 7 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; weak very fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; few very fine tubular pores and common very fine interstitial pores; 5 percent pebbles 1/4 inch in diameter; neutral; abrupt smooth boundary.

C1 7 to 41 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine interstitial pores; 5 percent pebbles 3/8 inch in diameter; neutral; gradual smooth boundary.

C2 41 to 60 inches; brownish yellow (10YR 6/6) sandy loam, yellowish brown (10YR 5/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; common very fine interstitial pores; 10 percent pebbles 3/8 inch in diameter; disseminated lime; slightly effervescent; mildly alkaline.

Depth to lime ranges from 30 to 40 inches.

The A horizon has color of 10YR 6/3 or 6/4. The content of pebbles ranges from 0 to 10 percent. The A horizon is 6 to 10 inches thick.

The C horizon to a depth of about 40 inches has color of 10YR 5/4, 6/3, or 6/4. It is sandy loam or fine sandy loam. The content of pebbles ranges from 0 to 10 percent. Below a depth of 40 inches, the profile is mildly alkaline or moderately alkaline. Content of pebbles ranges from 10 to 15 percent.

Wasco soils in this survey area are in a cool phase of the Wasco series. They are at a high elevation, and the average air temperature is at the low extreme of the defined range of characteristics for the series.

Wrightwood Series

The Wrightwood series consists of very deep, well drained soils on terrace remnants. Wrightwood soils formed in old alluvium derived dominantly from granitic material. Slopes range from 2 to 9 percent.

Soils of the Wrightwood series are coarse-loamy, mixed, mesic Typic Haploxeralfs.

Typical pedon of Wrightwood loamy sand, in an area of Wrightwood-Bull Trail association, sloping, east of Oak Hill Road, behind the highway at Summit Inn, about 50 feet from the southwest corner of the water tank, about 1,100 feet north and 200 feet east of the west corner of section 8, in the NW1/4SW1/4SW1/4 of sec. 8, T. 3 N., R. 5 W., in the Cajon Quadrangle.

A1 0 to 3 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) moist; weak very thin platy structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; few very fine interstitial pores; 10 percent pebbles 1/4 to 3/8 inch in diameter; neutral; clear smooth boundary.

B1t 3 to 9 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak fine and medium angular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots and few fine roots; few very fine interstitial pores and fine tubular pores; common thin clay films as bridges between mineral grains and lining tubular pores; 5 percent pebbles 1/4 to 3/8 inch in diameter; neutral; gradual smooth boundary.

B21t 9 to 22 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, friable, slightly sticky and nonplastic; few very fine, fine, and coarse roots; few very fine interstitial pores and fine tubular pores; few moderately thick clay films on faces of peds and many moderately thick clay films as bridges between mineral grains and lining tubular pores; 5 percent pebbles 1/4 to 1/2 inch in diameter; neutral; gradual smooth boundary.

B22t 22 to 46 inches; brown (7.5YR 5/2) sandy loam, dark brown (7.5YR 4/2) moist; moderate medium and coarse angular blocky structure; very hard, friable, slightly sticky and nonplastic; few very fine and fine roots; few very fine interstitial pores and few fine tubular pores; few moderately thick clay films on faces of peds and many moderately thick clay films between mineral grains and lining tubular pores; few discontinuous sandy clay loam bands about 1/2 to 3/4 inch thick; 10 percent pebbles 1/4 to 1/2 inch in diameter; neutral; clear smooth boundary.

B23tb 46 to 60 inches; brown (7.5YR 5/4) gravelly sandy loam, dark brown (7.5YR 4/4) moist; moderate coarse angular blocky structure; very hard, firm, sticky and plastic; few fine roots; few very fine interstitial pores; common moderate thick clay films on faces of peds and many moderately thick clay films as bridges between mineral grains and lining tubular pores; 20 percent pebbles 1/2 to 3/4 inch in diameter; slightly acid.

The A horizon has color of 10YR 4/3, 5/3, 5/4, 5/6, or 6/4. The content of gravel ranges from 5 to 15 percent. The A horizon is 1 inch to 3 inches thick.

The B2t horizon has color of 7.5YR 5/2, 5/4, 5/6, 5/8, 6/4, 6/6, or 6/8 or of 5YR 5/6 or 5/8. The content of gravel ranges from 5 to 15 percent.

The profile commonly has a buried argillic horizon. Depth to the upper boundary of the buried horizon ranges from about 40 to 51 inches. The buried horizon commonly is gravelly sandy loam or gravelly sandy clay

loam. The content of pebbles and cobbles ranges from 15 to 25 percent.

Yermo Series

The Yermo series consists of very deep, well drained soils on alluvial fans and hills. Yermo soils formed in gravelly and cobbly alluvium derived from mixed sources. Slopes range from 15 to 50 percent.

Soils of the Yermo series are loamy-skeletal, mixed (calcareous), thermic Typic Torriorthents.

Typical pedon of Yermo cobbly sandy loam, in an area of Yermo-Kimberlina, cool, association, sloping, in Lucerne Valley, about 0.6 mile southeast of Meridian Road on the trail to Pfizer Cement Plant, in the NE1/4NW1/4NE1/4 of sec. 6, T. 3 N., R. 1 E., in the Lucerne Valley Quadrangle.

A1 0 to 10 inches; pale brown (10YR 6/3) cobbly sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots; few fine interstitial pores; 15 percent pebbles and 10 percent cobbles; disseminated lime; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1 10 to 25 inches; very pale brown (10YR 7/3) gravelly sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common coarse and medium roots; common fine tubular pores; 15 percent pebbles and 5 percent cobbles; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C2 25 to 60 inches; light gray (10YR 7/2) very gravelly sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; few very fine interstitial and tubular pores; 55 percent pebbles and 15 percent cobbles; bottoms of coarse fragments have lime coatings 1/8 to 1/4 inch thick; disseminated lime; violently effervescent; moderately alkaline.

In some areas 30 to 50 percent of the surface layer is covered by gravel and cobbles.

The A horizon has color of 10YR 5/3, 5/4, 6/3, or 6/4. It is cobbly sandy loam or gravelly sandy loam. Content of pebbles ranges from 15 to 25 percent, and the content of cobbles ranges from 5 to 15 percent. The horizon is mildly alkaline to strongly alkaline. It is 8 to 12 inches thick.

The C horizon has color of 10YR 7/2 or 7/3. The content of pebbles in the C1 horizon ranges from 15 to 25 percent, and the content of cobbles is 5 percent in the upper 10 to 15 inches. The C2 horizon is 40 to 60 percent pebbles and as much as 15 percent cobbles.

Formation of the Soils

In this section, the factors that affect the formation of soils are discussed. Important processes that influence soil morphology and the formation of desert pavements and desert varnish are described.

Factors of Soil Formation

Soil is generally defined as a natural medium for the growth of plants. It is a three-dimensional body at the surface of the Earth and is composed of organic and mineral material. Soil characteristics are the result of physical and chemical processes produced by a combination of five factors parent material, topography, climate, living organisms, and time. The influence of any one of these factors can vary from place to place; hence, soils can differ within short distances in the same locality. The interaction of all five factors determines the kind of soil that forms.

The influence of each soil-forming factor on the soils in the survey area is summarized in the following paragraphs.

Parent Material

Parent material is the unconsolidated material in which soil forms. It mainly determines the chemical and mineralogical composition of the soil. The soils in the survey area formed in residuum and alluvium. The soils that formed in residuum are mainly on the foothills and mountains of the San Bernardino Mountains, in the southern part of the survey area, and on desert inselbergs scattered throughout the survey area. Inselbergs are prominent hills and mountains that rise abruptly from surrounding alluvial fans, terraces, and erosional surfaces (fig. 19). They are barren in most places, and are composed dominantly of rock resistant to weathering. Alluvium, eroded from these upland areas, has formed constructional alluvial surfaces. The soils that formed in alluvium are in basins and on alluvial fans and terraces of intermontane valleys. In many places, these valleys have been reworked by erosion and have complex geomorphic surfaces.

Most of the soils in the survey area formed in alluvium. All the alluvium is of mixed mineralogy, and the composition of the alluvium varies according to the source material. Alluvium derived from a variety of rock types, in which no one type is dominant, is the parent material of Cuddeback, Joshua, Kimberlina, Nebona, Victorville Variant, and Yermo soils. Soils that have formed in mixed alluvium in which granitic material is dominant are Halloran, Mirage, Norob, Rosamond, Victorville, and Wasco soils. Soils that have formed in granitic alluvium are Cajon, Hanford, Lucerne, Soboba, and Wrightwood soils.

Manet soils, though of mixed mineralogy, are derived dominantly from dark- colored micaceous material. The parent material of these soils is Pelona Schist. The high content of mica gives these sandy soils a dark color and an unusually "greasy" texture. It also gives the soils a higher available water capacity than is normal for sandy soils. In comparison, Cajon soils, which are sandy soils derived from granitic alluvium, are light-colored and have a low available water capacity.

Bousic and Peterman soils formed in fine-textured alluvium derived from mixed sources. These soils are on basin rims.

Some soils formed in material weathered from hard, acid igneous rock such as granite, granodiorite, and quartz monzonite (*16*). These soils, which are 15 to 40 inches deep, are the Arrastre, Crafton, Cushenbury, and Sheephead soils in the San Bernardino Mountains. Lithic Torriorthents formed on steep slopes on desert inselbergs that have similar lithology. These soils contain many angular particles of quartz.

Sparkhule soils formed in material weathered from hard volcanic rock such as basalt, andesite, and dacite on inselbergs. Because of the hardness of the parent rock and the steep slopes, these soils have lithic contact at a depth of 14 to 20 inches.

Trigger soils formed in residuum derived from hard sedimentary and metasedimentary rock, mainly limestone, marble, quartz mica schist, quartzite, and lime-cemented fanglomerate. The soils contain large amounts of lime and have lithic contact at a depth of 10 to 18 inches. The soil and parent rock are a good source of lime for the manufacture of cement.

In this survey area, the soils that formed in material weathered from granitic rock, schist, and sedimentary rock are moderately coarse and coarse textured and are less than 18 percent clay. The soils that formed in material derived from volcanic rock such as basalt, andesite, and dacite are moderately fine textured and are 25 to 35 percent clay.

The influence of the soil moisture and the soil temperature in the survey area obscures any obvious

Figure 19. Dead Man's Point, as viewed from the east, is an example of a desert inselberg.

relationships between the depth of the soil and the type of parent rock; however, where soil moisture is adequate and the soil temperature is mesic, soils that formed in material derived from granitic rock are 20 to 40 inches deep.

Topography

Topography affects the formation of soils through its effect on climatic influences, drainage, runoff, erosion, deposition, landform stability, and plant cover. Elevation and aspect, or direction of slope exposure, are topographic factors that can influence local climatic conditions. Slope characteristics such as shape, length, and gradient affect soil drainage, runoff, erosion, and deposition patterns. Topography is largely determined by the geology of the underlying formations, by uplifting, folding, and faulting, and by past cycles of erosion and dissection by rivers and streams. Knowledge of topography is useful in understanding the soil genesis and morphology in a soil survey area.

The entire area is drained by the Mojave River, which is formed by the merging of two tributaries that rise in the San Bernardino Mountains, Deep Creek and West Fork. The width of the river valley ranges from 1/2 mile to 2 miles. The valley lies 30 to 150 feet below adjoining terraces or alluvial fans. Victorville and Villa soils (Typic Torrifluvents) are on low river terraces and on the flood plain of the Mojave River, respectively. These low positions are subject to sediment deposition by flooding. Consequently, the organic matter content of the soils that formed in these deposits decreases irregularly as depth increases. Most of the organic matter is deposited along with the alluvium. Typically, soil development is negligible because of the long-term instability of the flood plain. There is a similar soil in the area that extends from the Sheep Creek drainageway west of

Phelan to Mirage Dry Lake. The Manet soils are also Typic Torrifluvents and are on alluvial fans.

Soils that have formed in fine-textured sediment are in playas in basin areas. Silt- and clay-sized particles are deposited in these low areas by runoff from adjacent fans. The runoff that accumulates in the playas evaporates. The runoff from the soils on basin rims and on the lower margins of alluvial fans flows away so slowly that water can accumulate before it slowly drains away or evaporates. The soils in such areas are the moderately well drained Bousic, Glendale Variant, and Peterman soils. Lavic soils, on the lower margins of fans, and Lovelace soils, on fans, have weakly and discontinuously cemented calcic horizons. Calcic horizons form because the soil is repeatedly saturated with water that is high in lime. The source of this water is either precipitation that percolates down through the soil or is a fluctuating high water table.

The excessively drained Arizo soils, somewhat excessively drained Cajon soils, and well drained Kimberlina and Wasco soils have no drainage restrictions. They are typical, nearly level to strongly sloping soils on recent, broad alluvial fans throughout the middle and northern parts of the survey area. These relatively coarse-textured soils are Entisols that have undergone very little profile development.

Rugged inselbergs rise above the terraces near the central part of the survey area. Rock outcrop dominates the areas of excessive relief, where rapid runoff and erosion have restricted soil development. On the steep side slopes, Lithic Torriorthents and Sparkhule soils (Lithic Haplargids) have developed. Both soils are less than 20 inches deep.

Halloran soils (Typic Natrargids) are moderately well drained soils in concave depressional areas on low river terraces. They are subject to ponding. In the past they were influenced by an intermittent high water table associated with climatic changes and by the meandering of the Mojave River channel. Because of evapotranspiration, saline ground water, and ponding, salts and alkali have become concentrated in the solum. Consequently, Halloran soils have natric horizons that have a strong prismatic structure, light gray A2 caps, and a high percentage of exchangeable sodium. They are strongly alkaline.

Peterson has studied several geomorphic surfaces in the part of the survey area south of Victorville and has developed many relationships relating soil formation to topography as influenced by recent and historical erosion cycles (*25*). The Cajon Fan, which is now truncated at the Inface Bluffs, had been a piedmont slope of the San Gabriel Mountains. Streams that had drained the San Gabriel Mountains and that incised the Cajon Fan were intercepted at the Inface Bluffs by the headward erosion of Cajon Creek. Oro Grande Wash, Broad Bottom Wash, and Antelope Valley are truncated streambeds that had carried water northward across the desert from the eastern part of the San Gabriel Mountains. This area is now drained southward by Cajon Creek.

The separation of the Inface Bluffs, which exposed late Pleistocene gravel, is attributed to the complex tectonics in the area and the resulting accelerated erosion. The San Andreas Fault and the San Jacinto Fault are 4 and 6 miles, respectively, south of the Inface Bluffs. Movement along these faults has been primarily lateral; consequently, the creation of the bluffs is not believed to be the result of a major uplift. Accelerated erosion resulting from tectonic disturbances and the headward erosion of Cajon Creek are thought to have created the bluffs.

These changes in the major drainage pattern have influenced soil formation on the Cajon Fan. Soils at the southern edge are relicts that were isolated on stable landforms when the drainage was intercepted. Bull Trail soils (Mollic Haploxeralfs) are on old fans and foothills just below the prominent cuestas, or hogbacks, along the bluffs near Cajon Summit. Typic Xerorthents are on the Inface Bluffs (fig. 20).

Arching, another tectonic process, is altering the Cajon Fan area. A study of the Palmdale Bulge shows that the surface of the southern end of the Cajon Fan rose 30 centimeters from 1959 to 1974 (*20*). This recent movement has increased the erosion rate of some soils in the area. Gullied land-Haploxeralfs association has been recently eroded.

Avawatz soils (Mollic Xerofluvents) and Oak Glen soils (Pachic Haploxerolls) are on the smooth alluvial fans in Antelope Valley, Summit Valley, and northern Swarthout Valley. Surface drainage and deposition have influenced the accumulation of organic matter in these soils. The Avawatz soils are on the lower ends of alluvial fans and in intermittent drainageways. They are somewhat excessively drained. The organic matter from the alluvium gives the epipedon its dark color, although the organic carbon content is less than 0.6 percent. The Oak Glen soils are on alluvial fans above intermittent drainageways and are well drained. The organic matter in the pachic mollic epipedon is derived from pedogenic accumulation on well drained alluvial fans and is inherited from the alluvial parent material.

Just north of Hesperia are moderately extensive, undulating terraces west and east of the Mojave River. Much of this landform is a relict surface that has been protected from both erosion and burial. On the west side, there are terrace remnants that have gently rounded interfluves in a northeast-southwest orientation. On the east side, undulating to gently rolling soils are on terrace remnants. Soils that have a thick solum, such as the Bryman and Helendale soils (Typic Haplargids), have developed on these surfaces. These relict surfaces had been part of the old, broad, transversely level, alluvial Cajon Fan. Gullies channeled erosion, bypassing parts of the fan. Subsequent retreat of the side slopes into the

Figure 20. Typic Xerorthents in an area of Bull Trail-Typic Xerorthents association, moderately steep. Actively eroding gullies are on this south-facing back slope.

relict surfaces produced the interfluves and undulating terrain. This remnant surface and the accompanying gullies predate the present Mojave River Valley.

In the southern part of the survey area, the direction of slope exposure also influences the kinds of soil that develop. The surface layer of the Crafton soils, for example, contains more organic matter than the surface layer of the Arrastre soils. Crafton soils are on short, steep, north-facing slopes on foothills and mountains. Arrastre soils are on upland positions that receive more sunlight. Crafton soils generally are cooler and retain moisture for longer periods of time. As a result they support more vegetation. More organic matter can accumulate because decomposition is slower.

Climate

Climate has a very strong influence on soil formation. Temperature and moisture influence the amount and kind of vegetation that grows, the rate at which organic matter decomposes, the rate at which rocks and minerals weather and the kinds of processes that occur to cause weathering, and the types of secondary minerals that form. Temperature and moisture are important factors in the removal and accumulation of material in soil horizons. Wind and moving water also affect the removal and accumulation of material on the surface.

Most of the survey area has an arid desert climate that consists of hot, dry summers and moderately cool, slightly moist winters. Part of the area has a Mediterranean climate, which consists of hot, dry summers and cool, moist winters. The survey area is in a broad climatic transition zone that extends from the humid San Bernardino Mountains to the arid mid-elevation Mojave Desert. The average annual temperature in the desert ranges from 52 to 60 degrees

F, and in the mountains it is 61 to 65 degrees. In the part of the survey area that extends from Newberry Springs, in the northeastern part of the survey area, to Victorville, in the central part, elevation is 2,800 feet and the average annual precipitation ranges from about 4 to 6 inches. In the San Bernardino Mountains, along the southern boundary near Grapevine Canyon, elevation is 6,000 feet and precipitation is as much as 25 inches. A narrow transitional area between the two extremes has an average annual temperature of 60 to 63 degrees and average annual precipitation of 6 to 9 inches. Although most of the precipitation in the desert falls in winter, summer thunderstorms and accompanying showers are not uncommon. Showers normally are intense and of short duration. Runoff is fairly rapid, and little water enters the soil.

The climate and soils influence what plants grow in the desert. Negligible rainfall late in spring and in summer, high temperatures in summer, and the resulting insufficient leaching of carbonates, soluble salts, and alkali from the root zone of the desert soils limit the kinds of plants that can grow. The vegetation consists of a sparse cover of xerophytes and halophytes. Desert soils such as Bousic, Glendale Variant, Halloran, Lavic, and Trigger soils that have an aridic moisture regime produce only small amounts of native vegetation (100 to 200 pounds per acre, dry weight, in normal years). The surface layer of these soils is less than 1 percent organic matter. The low content of organic matter is a result of rapid decomposition of the leaf litter and old roots because of high summer temperatures.

The low precipitation and limited natural leaching inherent in a desert climate help to promote the accumulation of soluble materials in the soil. Moisture, percolating downward through the soil, transports soluble material such as carbonates. These materials move to the depth of the wetting front where they precipitate and accumulate affecting soil horizonation. An example of this is the petrocalcic horizon in the Cave soils.

The upward movement of the soil moisture is also significant to soil formation in an arid climate. This is called capillary rise and is the result of a high evapotranspiration rate and a high water table. Salts and alkali in the ground water and from the soil are carried in a solution to the surface by capillary rise. The salts accumulate in soil pores and near plant roots. Glendale Variant and Peterman soils, for example, have accumulated salts at the surface.

Gusting winds and duststorms are common in the survey area. They transport and rework surface material such as carbonate dust, salts, and soil. For example, sand has been deposited on the surface of the Halloran soils.

Intense rainstorms of short duration can occur throughout the year and can accelerate sheet and gully erosion. Soils in the Gullied land-Haploxeralfs association have been eroded by water.

The transitional zone between the arid desert and the uplands has a Mediterranean climate. The vegetation is mainly California juniper, and there is less creosotebush than in the desert. The precipitation falls mainly in winter and leaches free carbonates and silicate clay deep into the profile. Hesperia soils (Xeric Torriorthents) and Lucerne soils (Xeralfic Haplargids) have developed in this transitional zone.

In the southern part of the survey area, on the high terraces and foothills of the San Bernardino mountains, summers are warm and dry and winters are cool and moist. Rainfall ranges from 14 to 18 inches annually, and the soils in this area have a xeric moisture regime. Bull Trail soils (Mollic Haploxeralfs) and Arrastre soils (Typic Xerochrepts) have developed in this area. The vegetation consists of juniper and grasses. The precipitation is sufficient for deep leaching to occur. Free carbonates have been leached out of the soil or to the lower part of the profile.

At slightly lower elevations, on high fans and in drainageways near the mountains, rainfall ranges from about 9 to 14 inches. The content of organic matter is too low or the epipedon is too thin for it to be mollic. In this area, an ochric epipedon formed in soils such as Tujunga (Typic Xeropsamments) and Avawatz (Mollic Xerofluvents).

At higher elevations, mainly in areas adjacent to the San Bernardino National Forest, precipitation ranges from 16 to 25 inches. Much of the precipitation falls as snow and tends to stay on the ground longer than it does at lower elevations. More organic matter has accumulated in the soils, and a thick, dark-colored, friable A horizon has formed. In places where precipitation is about 25 inches, slight leaching of bases has influenced the formation of Sheephead soils (Entic Ultic Haploxerolls). Cushenbury (Typic Haploxerolls) and Crafton soils (Entic Haploxerolls) have also formed in these areas.

Past climatic changes are known to have affected the survey area. Macrofossils of ancient woodrat middens in Lucerne Valley and throughout the Mojave Desert clearly indicate that certain arid areas of the high desert that now support only desert shrub vegetation supported woodlands of juniper or pinyon and juniper during intermittent pluvial periods as recently as 9,000 years ago (*34*). The frequently alternating cool-moist and warm-dry periods add to the complexity of the interaction of soil-forming factors. Climatic variations in moisture conditions are primarily responsible for changes in the chemistry and mineralogy of the subsoil, particularly in the transitional zone.

Strong horizonation is a characteristic of soils on old, stable remnant geomorphic surfaces throughout the survey area. Certain characteristics of these soils formed during cool, moist paleoclimatic periods. The red argillic horizon that formed in these soils is considered a relict of Pleistocene pluvial climates (*23*). Examples of other

horizons that formed during a moist climatic regime are the duripan and petrocalcic horizons. Some of the soils have both an argillic horizon and some form of hardpan. Joshua soils (Haplic Durargids) are an example. During a period when there was more available moisture, silica in the Joshua soils was mobilized and moved deep into the profile, where it formed discontinuous silica lenses. Mirage soils (Typic Haplargids), Nebona soils (Typic Durorthids), Cuddeback soils (Typic Durargids), and Cave soils (Typic Paleorthids) are other soils that have strongly developed profiles that formed during moist paleoclimatic periods.

Bryman soils are strongly developed as a result of past climatic influence. They are in fringe areas of the desert adjacent to areas that now receive 6 to 9 inches of precipitation annually. The soils are characterized by moderate amounts of montmorillonite and small amounts of kaolinitic clay. They have a red argillic horizon that extends below a depth of 60 inches in some areas.

Strong profiles develop in soils during moist climatic periods when water is plentiful. Water is the primary reactant in hydrolysis, which is a weathering reaction that chemically releases parent rock elements for transformation into secondary minerals or for translocation in solution. Organic matter aids the weathering process by supplying additional hydrogen ions for the reaction.

One element released by hydrolysis from both the secondary clay minerals and the primary minerals is iron. Free iron is released during wet periods, when weathering occurs and when moisture moves through the soil. Iron coats the clay particles, sand grains, and surfaces of peds to the depth of the wetting front, turning them red. This is a result of the amorphous iron hydroxide dehydrating into oxides of iron such as hematite. A moist period is required to initially release and transport the iron, and a subsequent dry period is required to dehydrate it (*8*). The degree of redness is an indicator of the degree of development.

Living Organisms

Vegetation plays an important part in many biological forces that affect the formation of soils. Plants, animals, insects, bacteria, and other organisms add organic matter to the soils. The kind of vegetation that grows on the soil influences the cycle of nutrient transfer and return. Because vegetation and other organisms are so closely associated with soil, and because both soil and vegetation are dependent on the climate, soil and vegetation can be considered a single system (*8*).

In the desert part of the survey area, the vegetation is mainly desert shrubs and a thin understory of annual grasses and herbs. Perennial grasses make up only a small percentage of the plant community and add little humus to the surface layer. Typically, the soils in these areas have a pale surface layer that is low in content of organic matter. Aridisols and Entisols that have an ochric epipedon developed under these conditions.

In higher areas on alluvial fans, terraces, and uplands, the amount of precipitation is higher. The vegetation is juniper and grasses or stands of mixed shrubs that have a fairly dense understory of grasses and herbs. At high elevations, where rainfall ranges from 16 to 25 inches, plant growth is densest. Soils typical of this area, Crafton, Cushenbury, Oak Glen, and Sheephead soils, have a mollic epipedon.

Small mammals, earthworms, insects, and micro-organisms also influence the formation of soils in many ways. They incorporate organic matter into the soil and mix the layers. Earthworms and other small invertebrates feed on the organic matter in the upper few inches of the soil. They slowly but continually mix the soil material and make it more permeable to water. Bacteria, fungi, algae, actinomyces, and other micro-organisms hasten the weathering of rocks and the decomposition of organic matter. Small animals such as pocket gophers and ground squirrels are prominent in areas of the Cajon, Manet, and Wrightwood soils.

Man has changed the soils in the survey area by leveling and smoothing areas for irrigation and by reshaping and grading. In many areas deep cuts and fills have been made. As a result, the surface layer has been moved, exposing the subsoil. This is especially evident wherever Halloran soils have been leveled.

The construction of dams and reservoirs on the upper reaches of the Mojave River has given man some control over the river. This has changed the pattern and frequency of deposition along the river. In the past, high-volume, erosive flows occurred in years of high rainfall. In these years, the Victorville and Villa soils were subject to flooding and deposition, which caused changes in the surface texture and inhibited soil development. The dams and reservoirs protect these soils by reducing the frequency of flooding.

Time

The effect of time on soil formation in the arid parts of the survey area is especially interesting from a pedogenetic viewpoint. Generally, the degree of profile development is related to the age of the soil, and usually a long time is required for soil formation. The age of a soil generally is not related to the geologic age of the parent rock or alluvium; it is determined by the action and interaction of the soil-forming factors. Unconsolidated material derived from pre-Cambrian Pelona Schist, for example, is the parent material of Manet soils, yet they are young soils with little profile development.

A varnished desert pavement of pebbles and cobbles has developed on terraces that are on Pleistocene nonmarine deposits. The rate of formation of desert varies with the local conditions. Desert varnish has been

known to form in the short span of 25 to 50 years in the survey area, although it is commonly thought to be the result of a slow process that can take as long as 20,000 to 50,000 years (*11*).

The desert pavement on which the varnish forms may be a better indicator of age. The highest shoreline reached during the latest rise of Lake Manix was dated by the carbon-14 method. Its age was determined to be 20,000 years (*18*). Surfaces below the shoreline do not have a desert pavement; therefore, it is assumed the geomorphic surfaces at elevations above the shoreline that have desert pavement are older than 20,000 years. The Cuddeback, Joshua, Mirage, and Nebona soils are on terraces on this kind of surface. These terraces have evidently been stable since early or mid-Pleistocene times. Because of this stability, a thick solum has developed in soils such as Mirage soils (Typic Haplargids). In other places on similar stable geomorphic surfaces, a fine-loamy argillic horizon and a duripan have developed in soils such as Cuddeback soils (Typic Durargids).

The presence of a calcic horizon in arid areas is an indication that the surface has been stable for an extended period of time. Calcic horizons have developed in Lavic and Lovelace soils.

Bryman and Helendale soils are Typic Haplargids that have a thick solum that developed in the late Pleistocene. They are on broad terraces that are extensive remnants of the Cajon Fan and once graded into playas or lakes. Thick, late Pleistocene sediment underlies these soils and the present Mojave River Valley. The age of this sediment has been determined by dating vertebrate fossils found in it (*4*).

There are young soils throughout the survey area that formed in Holocene alluvium and have developed little if at all. If irrigated, they are important agricultural soils. Some examples are the Cajon, Kimberlina, Manet, Victorville, Villa, and Wasco soils.

The variety of geomorphic surfaces and the wide range in soil development throughout the survey area demonstrate the effects of the interaction of the factors of soil formation. The role of time in soil development is especially evident where geomorphic surfaces have been undisturbed by erosion or deposition processes.

Processes of Soil Formation

By Arthur F. Fischer, III, soil scientist, Soil Conservation Service.

Many different kinds of soil have formed in the Mojave River Area. Some of the soils have little horizon differentiation, and others have strong profile development. Ongoing soil-forming processes and horizonation are evident in desert soils, but the extremes found in some soils on old stable and remnant surfaces are the results of processes affected by a moist paleoclimatic influence.

Several processes are involved in the formation of soils. These processes are the accumulation of organic matter, the formation and translocation of silicate clay, the accumulation of silica and lime, and the weathering of parent material. The differentiation of horizons is the result of one or more of these processes.

Accumulation of organic matter. The amount of organic matter accumulated in Oak Glen, Cushenbury, Crafton, and Sheephead soils is significant. These soils, on the San Bernardino Mountains and upland stream terraces, have a xeric moisture regime, support a relatively dense plant cover and have a dark-colored mollic epipedon. In contrast, Cajon, Arizo, and Kimberlina soils, on the desert, have a torric moisture regime, support a sparse plant cover, and have a pale ochric epipedon. This indicates that little organic matter has accumulated in the soils. This difference is a result of the minimal moisture available for plant growth and the rapid oxidation of organic matter in the hot, dry desert.

Formation and translocation of silicate clay. These processes are affected by the degree to which the parent material has weathered and the depth to which the clay-forming minerals have been leached. Paleoclimatic moisture would have promoted intense weathering and facilitated the deep percolation of water required to translocate minerals and promote clay formation. The results of these processes are evident in the thick, well developed B2t horizon of the Helendale and Bryman soils. The content of clay in the A horizon and in the B2t horizon differs by a weighted average of 8.2 percent in the Helendale soils and 16.8 percent in the Bryman soils. The subsoil in these soils is thicker than average for this area because the wetting front was lower than it is under the present climate.

Accumulation of silica and lime under the paleoclimatic influence. Soluble silica percolates downward in the soil and moves laterally downslope on fans. Periodic wetting and drying promote formation of a duripan and laminar opal caps after sufficient silica has accumulated. Cuddeback and Nebona soils are examples of soils that have a prominent duripan. The abundance of volcanic material in the mixed alluvium of these soils is the source of the available silica.

Soluble carbonates accumulate at the base of the wetting front, where the cycle of wetting and drying promotes the precipitation of lime. As a result, a calcic horizon has formed in the Mojave Variant soils and a petrocalcic horizon has formed in the Cave soils. In many places a laminar capping of silica-enriched cemented lime forms over the petrocalcic horizon. The limestone-rich and carbonate-rich sedimentary rock in the area is an abundant source of carbonates.

Weathering of parent material. The degree of weathering varies throughout the area. In the uplands where precipitation is more plentiful, Arrastre, Crafton, Cushenbury, and Sheephead soils have formed in granitic residuum and are 15 to 40 inches deep to lithic

contact. In desert areas, which receive appreciably less rainfall, Trigger soils, which formed in sedimentary and metasedimentary residuum, and Sparkhule soils, which formed in volcanic residuum, are less than 20 inches deep to lithic contact.

It is not completely understood how historical influences have affected the rate of weathering in the survey area. The arid conditions and fluctuating temperatures present in the desert today promote physical weathering processes such as expansion and contraction, which are caused by heating and cooling or wetting and drying. These processes require a long period of time to strongly affect the development of soils. A moister climate promotes chemical processes such as hydrolysis. Hydrolysis contributes to the intense weathering required for strong profile development in a short period of time.

Complex erosion and deposition patterns further complicate the problem. For example, well developed soils have been removed, covered, or truncated, or they have been left as relict soils on isolated stable surfaces.

Evidence of paleoclimatic moisture is abundant. Increased moisture accounts for the degree of weathering and the development of the soils on these stable remnant surfaces. The length of time these surfaces have remained undisturbed has also contributed to the strong development of the soils.

Formation of Desert Pavement and Desert Varnish

Of particular interest in the Mojave River Area is the formation of a desert pavement and desert varnish and their effect on the morphology of the soils under them.

Desert pavement is an armored surface of rock fragments covering and protecting the soil (fig. 21). The fragments range from pebbles to stones. The pavement consists of rounded or angular fragments and generally is only one fragment thick. It is on or partially set in the surface of the soil in a mode reflecting stability of the environment. Desert pavement is common on the smooth interfluvial surfaces of terraces of old alluvial fans adjacent to desert uplands. It generally forms on surfaces over mixed and unsorted alluvium where slopes are nearly level or gently sloping.

The processes that cause a desert pavement to form are generally grouped into three categories.

Deflation of fine material. Winds of sufficient velocity move fine particles of soil leaving behind a concentration of rock fragments. The number of fragments left depends on the content of coarse fragments in the soil, the depth of deflation, and time.

Removal of fines by surface water. Fine soil particles are sorted and removed by rain and runoff, leaving a concentration of rock fragments. Experimental work has shown that under uniform rainfall, a desert pavement forms on the steeper slopes before it forms on the gentler slopes (*8*).

Upward movement of rock fragments. In many soils that have a desert pavement, the upper horizons are relatively free of rock fragments but the lower horizons have an abundance of them. This indicates an upward migration of rock fragments. It is possible that wetting and drying of the soil to the depth of the wetting front is the mechanism for this movement. Upon wetting, the soil expands and the coarse fragments are lifted slightly. As the soil dries, it shrinks, and cracks form that are too small for the fragments to move into. The cracks are filled by fine particles until the next cycle begins. This explanation presupposes a subsoil containing expanding montmorillonitic clay. This type of clay is in most soils that have a desert pavement in the Mojave River Area. Paleoclimatic freezing and thawing are also considered to have been a possible mechanism.

Most desert pavements are formed, in part, by each of these processes; however, the degree of influence depends principally on topography (remnant surface or active one), sediment characteristics, and climate.

Desert varnish is a thin, very dark or black, mineralized layer on the surface of the rock fragments in a desert pavement. It is one of the most prominent features of the desert landscape. The varnish is at least 70 percent clay and has a higher content of iron oxide and manganese oxide than the underlying rock (*27*). The varnish on the upper surfaces of the fragments is dark and has a higher content of manganese oxide. The varnish or the underside of fragments is reddish and has a higher content of iron oxide.

Because the varnish has a distinct morphology, it is believed to form from constituents supplied by external sources. These sources may include windborne material and particles from the surrounding soils that are sorted in solution and carried to the surface of the fragment. The length of time needed for desert varnish to form is a point of disagreement. Some believe it can form in 25 to 50 years, but others believe it requires 20,000 to 50,000 years (*11*). Some believe that the length of time varies with the local conditions.

Once a desert pavement is established, the soil below it has an armored surface that protects it from further erosion. The stability of the pavement regulates the processes of soil formation. As a result, development is strong and commonly is unique.

The soil under a desert pavement characteristically has a thin A horizon about 1 inch to 5 inches thick. It generally is free of gravel, is loam or sandy loam, and has vesicular pores. The A horizon has a thin surface crust that commonly impedes water infiltration. Formation of the crust is a result of wetting and drying, which causes clay particles to clog the pores and sodium to disperse surface colloids. Vesicular pores are believed to form in response to the wetting and drying of this unstable horizon. Trapped air becomes pressurized

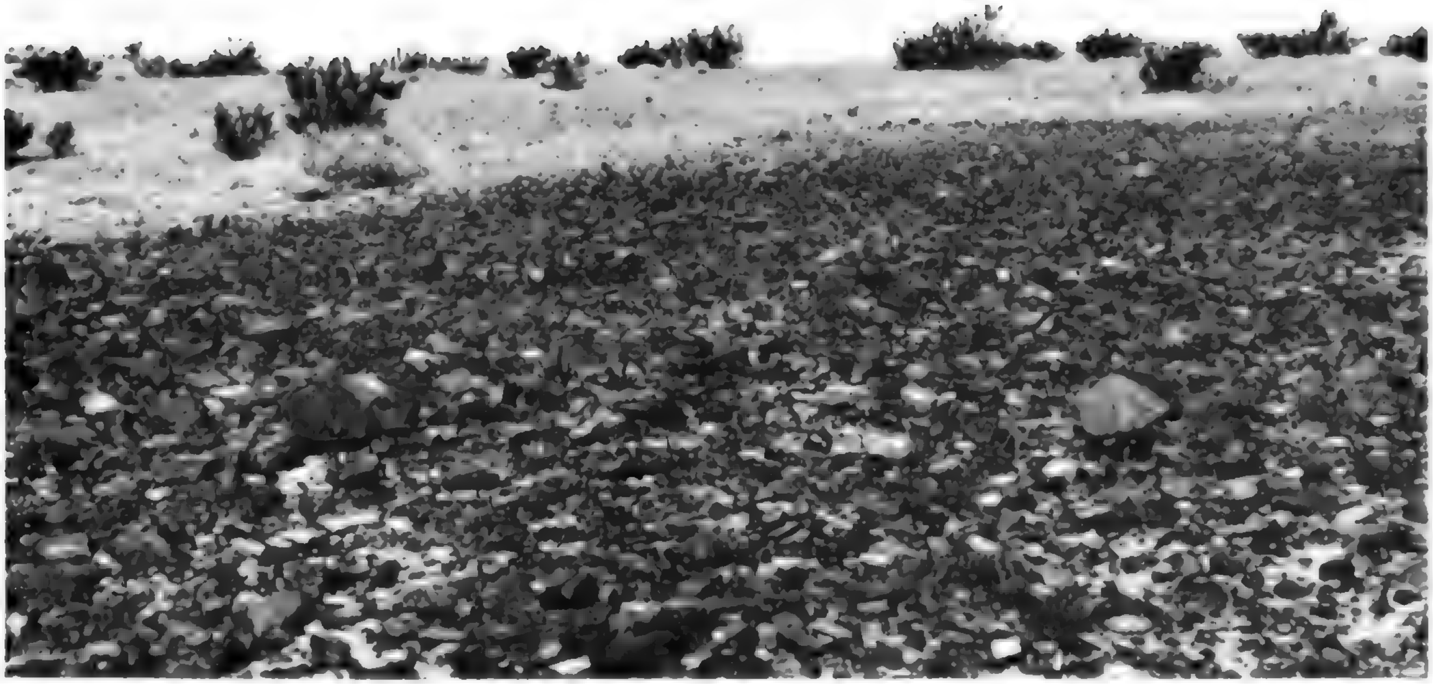

Figure 21. The desert pavement on Mirage sandy loam, 2 to 5 percent slopes, is varnished.

during heating and drying and expands to form rounded cavities. The vesicular horizon is a distinctive characteristic of soils that developed under a desert pavement.

Paved surfaces are essentially barren of vegetation, which is another striking feature of the landscape. It is attributed to the slow permeability of the soil; the toxic effects of the salt and alkali on seedlings; and the high rate of runoff, which reduces the available soil moisture (*22*).

Typically, the soils under a desert pavement are slightly to strongly saline-alkali, which increases as depth increases, but geographically associated soils that do not have a pavement are not. Soils under a desert pavement normally have a strongly developed argillic horizon, but there are exceptions. Nebona soils have a well developed duripan, but they do not have an argillic horizon. Mirage, Joshua, and Cuddeback soils have a desert pavement and a thick argillic horizon.

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Glossary

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal-unit-month. The amount of forage or feet required to feed one animal unit (one cow, one horse, five sheep, or five goats) for 30 days.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

	Inches
Very low	0 to 2.5
Low	2.5 to 5. 0
Moderate	5. 0 to 7.5
High	7.5 to 10
Very high	More than 10

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Coarse-textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose. Noncoherent when dry or moist; does not hold together in a mass.

Friable. When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm. When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic. When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky. When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard. When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft. When dry, breaks into powder or individual grains under very slight pressure.

Cemented. Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cuesta. An asymmetric, homoclinal ridge capped by resistant rock layers of slight to moderate dip.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Desert pavement. A layer of gravel or coarser fragments on a desert soil surface that was emplaced by upward movement of fragments from underlying sediment or that remains after finer particles have been removed by running water or wind.

Desert varnish. A dark or black coating on rock fragments that is made up of clay, iron oxides, and manganese oxides.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained. Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained. Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained. Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained. Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below

the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained. Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained. Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained. Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature; for example, fire that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines(in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fanglomerate (geology). Heterogeneous material which was originally deposited on an alluvial fan but which, since deposition, has been cemented into solid rock.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine-textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon. An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon. The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon. The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon. The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer. Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Inselberg. An isolated, steep residual hill or mountain that is generally bare and rocky and that rises abruptly from surrounding low surfaces.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0. 75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. The area between two adjacent streams flowing in the same direction.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Border. Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin. Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Corrugation. Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle). Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow. Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler. Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium-textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance, *few*, *common*, and *many*; size, *fine*, *medium*, and *coarse*; and contrast, *faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nurse crop. A companion crop sown simultaneously with another crop to protect it. Clover, for example, is sometimes seeded with a small grain to protect the grain crop.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pediment. The surface of the land that develops at the foot of a receding hill or mountain.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content with in which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05

millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $Ca^{++} + Mg^{++}$. The degrees of sodicity are:

	SAR
Slight	Less than 13:1
Moderate	13-30:1
Strong	More than 30:1

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 6 to 15 inches (15 to 38 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.1 inch or more	Average snowfall
Recorded in the period 1951-77 at Barstow, Calif.											
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	60.1	31.2	45.7	76	15	24	0.54	---	0.94	2	0.1
February---	65.8	35.2	50.5	82	20	97	0.37	---	0.63	1	0.1
March------	70.2	39.4	54.8	87	25	184	0.36	0.01	0.61	1	0.1
April------	77.1	44.9	58.7	94	31	526	0.21	---	0.38	1	0.0
May--------	86.1	52.6	69.4	103	39	601	0.08	---	0.15	0	0.0
June-------	95.6	60.6	78.3	110	47	849	0.11	---	---	0	0.0
July-------	102.6	67.5	85.0	111	55	1,085	0.32	---	0.56	1	0.0
August-----	100.4	65.3	82.8	109	52	1,017	0.26	---	0.45	1	0.0
September--	94.3	58.7	76.5	107	45	795	0.34	---	0.54	1	0.0
October----	82.7	47.8	65.2	97	32	471	0.20	---	0.38	1	0.0
November---	68.8	37.4	53.1	84	22	122	0.48	0.02	0.81	2	0.0
December---	60.1	30.9	45.5	75	17	29	0.53	---	0.92	1	0.5
Yearly:											
Average--	80.3	47.6	63.8	---	---	---	---	---	---	---	---
Extreme--	---	---	---	112	13	---	---	---	---	---	---
Total----	---	---	---	---	---	5,800	3.80	2.06	5.20	12	0.8

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.1 inch or more	Average snowfall
Recorded in the period 1951-77 at Victorville, Calif.											
	°F	°F	°F	°F	°F	Units	In	In	In		In
January---	58.1	29.3	43.7	76	13	15	0.81	0.06	1.36	2	0.9
February--	62.3	32.6	47.5	80	18	60	0.58	---	0.98	2	0.1
March-----	65.8	35.8	50.8	85	22	122	0.47	0.02	0.81	2	0.2
April-----	72.6	40.6	56.6	91	29	227	0.33	---	0.56	1	0.0
May-------	80.9	47.3	64.1	99	34	442	0.14	---	0.23	0	0.0
June------	90.5	54.2	72.4	108	41	672	0.05	---	0.02	0	0.0
July------	97.8	61.4	79.6	108	49	918	0.21	---	0.21	0	0.0
August----	96.5	60.3	78.4	107	46	880	0.19	---	0.31	1	0.0
September-	90.7	54.3	72.5	104	41	675	0.37	---	0.51	1	0.0
October---	80.1	44.5	62.3	97	29	386	0.23	---	0.40	1	0.0
November--	67.2	35.3	51.3	84	20	104	0.60	0.04	1.02	2	0.4
December--	59.0	29.4	44.2	76	15	21	0.60	---	1.03	2	0.2
Yearly----											
Average-	76.8	43.8	60.3	---	---	---	---	---	---	---	---
Extreme-	---	---	---	109	11	---	---	---	---	---	---
Total---	---	---	---	---	---	4,522	4.49	2.47	6.19	14	1.8

[1] A growing degree day is an index of the amount of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Recorded in the period 1951-77 at Barstow, Calif.			
Last freezing temperature in spring:			
1 year in 10 later than--	March 1	March 29	April 16
2 years in 10 later than--	February 20	March 21	April 8
5 years in 10 later than--	February 3	March 5	March 25
First freezing temperature in fall:			
1 year in 10 earlier than--	November 16	November 5	October 29
2 years in 10 earlier than--	November 23	November 10	November 3
5 years in 10 earlier than--	December 7	November 20	November 13
Recorded in the period 1951-77 at Victorville, Calif.			
Last freezing temperature in spring:			
1 year in 10 later than--	March 19	April 14	May 3
2 years in 10 later than--	March 11	April 5	April 27
5 years in 10 later than--	February 24	March 19	April 15
First freezing temperature in fall:			
1 year in 10 earlier than--	November 8	October 29	October 20
2 years in 10 earlier than--	November 14	November 3	October 25
5 years in 10 earlier than--	November 25	November 12	November 5

TABLE 3.--GROWING SEASON

Probability	Length of growing season if daily minimum temperature exceeds--		
	24° F	28° F	32° F
Recorded in the period 1951-77 at Barstow, Calif.			
	Days	Days	Days
9 years in 10	270	228	201
8 years in 10	282	239	212
5 years in 10	306	259	232
2 years in 10	331	280	252
1 year in 10	346	291	262
Recorded in the period 1951-77 at Victorville, Calif.			
	Days	Days	Days
9 years in 10	242	205	176
8 years in 10	253	216	185
5 years in 10	275	238	203
2 years in 10	297	260	221
1 year in 10	311	271	231

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
100	Arizo gravelly loamy sand, 2 to 9 percent slopes	9,500	0.8
101	Arrastre-Rock outcrop complex, 30 to 50 percent slopes	12,100	1.1
102	Avawatz-Oak Glen association, gently sloping	12,000	1.0
103	Badland	3,500	0.3
104	Bousic clay	7,500	0.6
105	Bryman loamy fine sand, 0 to 2 percent slopes	38,000	3.2
106	Bryman loamy fine sand, 2 to 5 percent slopes	25,700	2.1
107	Bryman loamy fine sand, 5 to 9 percent slopes	8,000	0.7
108	Bryman loamy fine sand, 9 to 15 percent slopes	3,000	0.3
109	Bryman sandy clay loam, 0 to 2 percent slopes	500	*
110	Bryman-Cajon association, rolling	7,500	0.6
111	Bull Trail-Typic Xerorthents association, moderately steep	8,800	0.7
112	Cajon sand, 0 to 2 percent slopes	46,200	3.9
113	Cajon sand, 2 to 9 percent slopes	117,200	9.8
114	Cajon sand, 9 to 15 percent slopes	6,600	0.6
115	Cajon gravelly sand, 2 to 15 percent slopes	59,400	5.0
116	Cajon loamy sand, 5 to 9 percent slopes	8,600	0.7
117	Cajon loamy sand, loamy substratum, 0 to 2 percent slopes	28,800	2.4
118	Cajon-Arizo complex, 2 to 15 percent slopes	66,000	5.5
119	Cajon-Wasco, cool, complex, 2 to 9 percent slopes	5,900	0.5
120	Cave loam, dry, 0 to 2 percent slopes	4,100	0.3
121	Crafton-Sheephead-Rock outcrop association, steep	7,000	0.6
122	Cushenbury-Crafton-Rock outcrop complex, 15 to 50 percent slopes	12,900	1.1
123	Dune land	6,200	0.5
124	Fluvents, occasionally flooded	1,100	0.1
125	Glendale Variant silt loam, saline-alkali	2,300	0.2
126	Gullied land-Haploxeralfs association	19,900	1.7
127	Halloran sandy loam	21,200	1.8
128	Halloran-Dune land complex, 0 to 15 percent slopes	2,900	0.2
129	Hanford sandy loam, cool, 2 to 9 percent slopes	800	*
130	Haplargids-Calciorthids complex, 15 to 50 percent slopes	4,100	0.3
131	Helendale loamy sand, 0 to 2 percent slopes	9,200	0.8
132	Helendale loamy sand, 2 to 5 percent slopes	16,600	1.4
133	Helendale-Bryman loamy sands, 2 to 5 percent slopes	43,500	3.6
134	Hesperia loamy fine sand, 2 to 5 percent slopes	19,200	1.6
135	Joshua loam, 2 to 5 percent slopes	14,200	1.2
136	Joshua loam, 9 to 15 percent slopes	4,700	0.4
137	Kimberlina loamy fine sand, cool, 0 to 2 percent slopes	17,800	1.5
138	Kimberlina loamy fine sand, cool, 2 to 5 percent slopes	3,000	0.3
139	Kimberlina gravelly sandy loam, cool, 2 to 5 percent slopes	5,400	0.5
140	Lavic loamy fine sand	5,500	0.5
141	Lovelace loamy sand, 5 to 9 percent slopes	4,500	0.4
142	Lucerne sandy loam, 0 to 2 percent slopes	4,800	0.4
143	Lucerne sandy loam, 2 to 5 percent slopes	6,400	0.5
144	Manet coarse sand, 2 to 5 percent slopes	29,200	2.4
145	Manet cobbly coarse sand, 2 to 9 percent slopes	2,400	0.2
146	Manet loamy sand, loamy substratum, 0 to 2 percent slopes	9,300	0.8
147	Manet fine sandy loam, 0 to 2 percent slopes	1,800	0.2
148	Mirage sandy loam, 2 to 5 percent slopes	22,000	1.8
149	Mirage-Joshua complex, 2 to 5 percent slopes	44,000	3.7
150	Mohave Variant loamy sand, 0 to 2 percent slopes	2,200	0.2
151	Nebona-Cuddeback complex, 2 to 9 percent slopes	32,300	2.7
152	Norob-Halloran complex, 0 to 5 percent slopes	41,800	3.5
153	Peterman loam	300	*
154	Peterman clay	1,900	0.2
155	Pits	1,500	0.1
156	Playas	19,500	1.6
157	Riverwash	11,600	1.1
158	Rock outcrop-Lithic Torriorthents complex, 15 to 50 percent slopes	112,700	9.4
159	Rosamond loam, saline-alkali	9,200	0.8
160	Rosamond loam, strongly saline-alkali	600	*
161	Soboba gravelly sand, cool, 2 to 9 percent slopes	1,300	0.1
162	Sparkhule-Rock outcrop complex, 15 to 50 percent slopes	43,400	3.6
163	Torriorthents-Torripsamments-Urban land complex, 0 to 9 percent slopes	1,900	0.2
164	Trigger gravelly loam, 5 to 15 percent slopes	7,200	0.6
165	Trigger-Sparkhule-Rock outcrop association, steep	2,800	0.2
166	Trigger-Rock outcrop complex, 30 to 50 percent slopes	5,200	0.4
167	Tujunga sand, cool, 2 to 9 percent slopes	1,600	0.1
168	Typic Haplargids-Yermo complex, 8 to 30 percent slopes	7,500	0.6
169	Victorville sandy loam	6,300	0.5

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
170	Victorville Variant sand	2,600	0.2
171	Villa loamy sand	13,700	1.1
172	Villa loamy sand, hummocky	3,000	0.3
173	Wasco sandy loam, cool, 0 to 2 percent slopes	16,000	1.3
174	Wasco sandy loam, cool, 2 to 5 percent slopes	4,100	0.3
175	Wrightwood-Bull Trail association, sloping	7,300	0.6
176	Yermo gravelly sandy loam, 30 to 50 percent slopes	2,600	0.2
177	Yermo-Kimberlina, cool, association, sloping	18,200	1.5
	Water	900	*
	Total	1,200,000	100.0

* Less than 0.1 percent.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo- sition
			Lb/acre		Pct
100 Arizo	Gravelly Coarse Loamy(30f)	Favorable	400	Creosotebush	10
		Normal	200	Red brome	10
		Unfavorable	100	White bursage	5
				Galleta	5
				Indian ricegrass	5
				Filaree	5
				Joshua-tree	5
				Pricklypear	5
				Desert needlegrass	5
				Desert alyssum	5
101*:					
Arrastre	Coarse Loamy(20e)	Favorable	1,200	Desert needlegrass	15
		Normal	800	California buckwheat	15
		Unfavorable	500	Desert sage	10
				California juniper	10
				Cheatgrass	5
				Phacelia	5
				Filaree	5
				Nevada ephedra	5
				Bush senecio	5
Rock outcrop.					
102*:					
Avawatz	Coarse Loamy(20e)	Favorable	1,800	Desert needlegrass	20
		Normal	1,000	Big sagebrush	10
		Unfavorable	500	Bluegrass	10
				Red brome	10
				Canyon oak	5
				Mediterranean schismus	5
				California juniper	5
				Chamise	5
				Nevada ephedra	5
				Filaree	5
				Joshua-tree	5
				Poison-oak	5
Oak Glen	Coarse Loamy(20e)	Favorable	2,100	Needlegrass	20
		Normal	1,200	Singleleaf pinyon	15
		Unfavorable	800	Bluegrass	10
				Big sagebrush	10
				California buckwheat	10
				Filaree	5
				Brome	5
				Oak	5
				Desert almond	5
				California juniper	5
104 Bousic	Alkali Clayey(30f)	Favorable	300	Allscale saltbush	20
		Normal	200	Shadscale	10
		Unfavorable	50	Brome	10
				Goldenbush	5
				Filaree	5
				Desert alyssum	5
				Horsebrush	5
				Seablite	5
				Princesplume	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
105, 106, 107, 108- Bryman	Sandy(30f)	Favorable	500	Creosotebush	15
		Normal	300	Indian ricegrass	10
		Unfavorable	100	Red brome	10
				Mediterranean schismus	5
				Goldenhead	5
				Desert needlegrass	5
				Filaree	5
				Joshua-tree	5
				White bursage	5
				Spiny hopsage	5
				Bush senecio	5
109 Bryman	Fine Loamy(30f)	Favorable	600	Saltbush	20
		Normal	400	Filaree	15
		Unfavorable	200	Mediterranean schismus	10
				Buckwheat	10
				Cheatgrass	5
				Phacelia	5
				Sphaeralcea	5
110*:					
Bryman	Sandy(30e,f)	Favorable	1,000	Creosotebush	15
		Normal	700	Red brome	15
		Unfavorable	400	Desert needlegrass	10
				Bush senecio	10
				Mediterranean schismus	5
				Joshua-tree	5
				California juniper	5
				Buckwheat	5
				California buckwheat	5
				Horsebrush	5
				Winterfat	5
				Boxthorn	5
				Nevada ephedra	5
Cajon	Cobbly Sandy(30f,g)	Favorable	300	Creosotebush	15
		Normal	100	Desert needlegrass	15
		Unfavorable	50	Filaree	5
				White bursage	5
				Mediterranean schismus	5
				Ephedra	5
				Rabbitbrush	5
				Indian ricegrass	5
				Red brome	5
				Cactus	5
				Buckwheat	5
				Phacelia	5
111*:					
Bull Trail	Coarse Loamy(20e)	Favorable	1,800	Desert needlegrass	15
		Normal	800	California juniper	15
		Unfavorable	400	Filaree	10
				Bluegrass	10
				Red brome	5
				Shrub live oak	5
				California buckwheat	5
				Rubber rabbitbrush	5
Typic Xerorthents.					

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo- sition
			Lb/acre		Pct
112, 113, 114 Cajon	Sandy(30f,g)	Favorable	500	Creosotebush	15
		Normal	200	Indian ricegrass	15
		Unfavorable	100	White bursage	5
				Mediterranean schismus	5
				Ephedra	5
				Rabbitbrush	5
				Desert needlegrass	5
				Filaree	5
				Red brome	5
				Cactus	5
				Joshua-tree	5
				Popcornflower	5
				Malacothrix	5
115 Cajon	Cobbly Sandy(30f,g)	Favorable	300	Creosotebush	15
		Normal	100	Desert needlegrass	15
		Unfavorable	50	Filaree	5
				White bursage	5
				Mediterranean schismus	5
				Ephedra	5
				Rabbitbrush	5
				Indian ricegrass	5
				Red brome	5
				Cactus	5
				Buckwheat	5
				Phacelia	5
116 Cajon	Sandy(30f,g)	Favorable	400	Creosotebush	15
		Normal	200	Indian ricegrass	15
		Unfavorable	100	White bursage	5
				Mediterranean schismus	5
				Ephedra	5
				Rabbitbrush	5
				Desert needlegrass	5
				Filaree	5
				Red brome	5
				Cactus	5
				Joshua-tree	5
				Popcornflower	5
				Malacothrix	5
117 Cajon	Sandy(30f)	Favorable	300	Creosotebush	10
		Normal	100	White bursage	10
		Unfavorable	50	Mediterranean schismus	10
				Saltbush	10
				Indian ricegrass	10
				Nevada ephedra	5
				Filaree	5
				Buckwheat	5
				Popcornflower	5
118*:					
Cajon	Cobbly Sandy(30f)	Favorable	300	Creosotebush	15
		Normal	100	Desert needlegrass	15
		Unfavorable	50	Filaree	5
				White bursage	5
				Mediterranean schismus	5
				Ephedra	5
				Rabbitbrush	5
				Indian ricegrass	5
				Red brome	5
				Cactus	5
				Buckwheat	5
				Phacelia	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
118*:					
Arizo	Gravelly Coarse Loamy(30f)	Favorable	400	Creosotebush	10
		Normal	200	Red brome	10
		Unfavorable	100	White bursage	5
				Galleta	5
				Indian ricegrass	5
				Filaree	5
				Joshua-tree	5
				Pricklypear	5
				Desert needlegrass	5
				Desert alyssum	5
119*:					
Cajon	Sandy(30f,g)	Favorable	500	Creosotebush	15
		Normal	200	Indian ricegrass	15
		Unfavorable	100	White bursage	5
				Mediterranean schismus	5
				Ephedra	5
				Rabbitbrush	5
				Desert needlegrass	5
				Filaree	5
				Red brome	5
				Cactus	5
				Joshua-tree	5
				Popcornflower	5
				Malacothrix	5
Wasco	Coarse Loamy(30f,g)	Favorable	500	Creosotebush	15
		Normal	200	Mediterranean schismus	10
		Unfavorable	100	Filaree	10
				Red brome	10
				White bursage	5
				Nevada ephedra	5
				Desert alyssum	5
				Saltbush	5
				Mojave cottonthorn	5
120 Cave	Coarse Loamy(30f,g)	Favorable	400	Creosotebush	10
		Normal	200	Indian ricegrass	10
		Unfavorable	100	Fourwing saltbush	10
				White bursage	10
				Nevada ephedra	5
				Shadscale	5
				Globemallow	5
121*:					
Crafton	Coarse Loamy(20e)	Favorable	1,800	Desert needlegrass	10
		Normal	800	California juniper	10
		Unfavorable	500	Brome	10
				California buckwheat	10
				Filaree	5
				Pine bluegrass	5
				Ephedra	5
				Singleleaf pinyon	5
				Desert bitterbrush	5
				Yucca	5
				Desert almond	5
Sheephead.					
Rock outcrop.					

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Compo-sition
		Kind of year	Dry weight		
			Lb/acre		Pct
122*:					
Cushenbury	Coarse Loamy(20e)	Favorable	1,800	Desert needlegrass	10
		Normal	800	Brome	10
		Unfavorable	500	California juniper	10
				California buckwheat	10
				Pine bluegrass	5
				Filaree	5
				Yucca	5
				Ephedra	5
				Desert almond	5
				Desert bitterbrush	5
				California fremontia	5
				Singleleaf pinyon	5
				Sphaeralcea	5
				Cactus	5
				Squirreltail	5
Crafton	Coarse Loamy(20e)	Favorable	1,800	Desert needlegrass	10
		Normal	800	California juniper	10
		Unfavorable	500	Brome	10
				California buckwheat	10
				Filaree	5
				Pine bluegrass	5
				Ephedra	5
				Singleleaf pinyon	5
				Desert bitterbrush	5
				Yucca	5
				Desert almond	5
Rock outcrop.					
125 Glendale Variant	Alkali Loamy(30f)	Favorable	200	Allscale saltbush	15
		Normal	100	Shadscale	10
		Unfavorable	50	Mediterranean schismus	10
				Brome	10
				Wallflower	10
				Filaree	5
				Desert alyssum	5
127 Halloran	Alkali Sandy(30f,g)	Favorable	200	Creosotebush	20
		Normal	100	Mediterranean schismus	15
		Unfavorable	25	Allscale saltbush	15
				Filaree	10
				White bursage	10
				Primrose	5
				Goldenbush	5
				Cactus	5
				Mojave seablite	5
				Fourwing saltbush	5
128*:					
Halloran	Alkali Sandy(30f,g)	Favorable	200	Creosotebush	20
		Normal	100	Mediterranean schismus	15
		Unfavorable	25	Allscale saltbush	15
				Filaree	10
				White bursage	10
				Primrose	5
				Goldenbush	5
				Cactus	5
				Mojave seablite	5
				Fourwing saltbush	5
Dune land.					

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo-sition
			Lb/acre		Pct
129: Hanford	Coarse Loamy(30e)	Favorable	1,200	Desert needlegrass	15
		Normal	700	Red brome	10
		Unfavorable	500	California juniper	10
				Filaree	5
				Desert sage	5
				California buckwheat	5
				Joshua-tree	5
				Nevada ephedra	5
				Desert alyssum	5
131, 132: Helendale	Sandy(30f)	Favorable	400	Creosotebush	20
		Normal	200	Red brome	10
		Unfavorable	100	Indian ricegrass	10
				Filaree	10
				White bursage	10
				Mediterranean schismus	5
				Cactus	5
				Joshua-tree	5
133*:					
Helendale	Sandy(30f)	Favorable	400	Creosotebush	20
		Normal	200	Red brome	10
		Unfavorable	100	Indian ricegrass	10
				Filaree	10
				White bursage	10
				Mediterranean schismus	5
				Cactus	5
				Joshua-tree	5
Bryman	Sandy(30f)	Favorable	500	Creosotebush	15
		Normal	300	Indian ricegrass	10
		Unfavorable	100	Red brome	10
				Mediterranean schismus	5
				Goldenhead	5
				Desert needlegrass	5
				Filaree	5
				Joshua-tree	5
				White bursage	5
				Spiny hopsage	5
				Bush senecio	5
134: Hesperia	Coarse Loamy(30e)	Favorable	1,200	Desert needlegrass	20
		Normal	600	Bluegrass	10
		Unfavorable	500	California juniper	10
				Red brome	5
				California buckwheat	5
				Nevada ephedra	5
				Joshua-tree	5
				Big sagebrush	5
				Filaree	5
				Goldenbush	5
				Desert sage	5
135, 136: Joshua	Desert Pavement(30g)	Favorable	300	Filaree	20
		Normal	150	Creosotebush	20
		Unfavorable	50	Mediterranean schismus	10
				White bursage	5
				Gilia	5
				Annual lotus	5
				Malacothrix	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
137, 138 Kimberlina	Sandy(30f)	Favorable	400	Creosotebush	15
		Normal	200	Indian ricegrass	10
		Unfavorable	100	Saltbush	10
				Mediterranean schismus	5
				White bursage	5
				Yucca	5
				Buckwheat	5
				Filaree	5
				Cactus	5
				Malacothrix	5
139 Kimberlina	Coarse Loamy(30f,g)	Favorable	300	Creosotebush	25
		Normal	200	Mediterranean schismus	15
		Unfavorable	50	Filaree	10
				White bursage	10
				Boxthorn	10
				Desert alyssum	5
				Dalea	5
				Red brome	5
140 Lavic	Sandy(30f)	Favorable	400	Indian ricegrass	15
		Normal	200	Brome	10
		Unfavorable	100	White bursage	10
				Creosotebush	10
				Saltbush	10
				Buckwheat	5
				Shadscale	5
				Joshua-tree	5
				Nevada ephedra	5
				Little horsebrush	5
				Boxthorn	5
				Malacothrix	5
141 Lovelace	Sandy(30f)	Favorable	300	Creosotebush	15
		Normal	200	Indian ricegrass	10
		Unfavorable	50	White bursage	10
				Shadscale	10
				Filaree	5
				Joshua-tree	5
142, 143 Lucerne	Coarse Loamy(30e)	Favorable	1,200	Desert needlegrass	10
		Normal	600	California juniper	10
		Unfavorable	400	California buckwheat	10
				Mediterranean schismus	5
				Brome	5
				Goldenbush	5
				Joshua-tree	5
				Ephedra	5
				Bladdersage	5
				Filaree	5
				Horsebrush	5
				Bush senecio	5
144 Manet	Sandy(30f,g)	Favorable	300	Indian ricegrass	20
		Normal	200	Creosotebush	15
		Unfavorable	50	Mediterranean schismus	10
				Filaree	10
				Gilia	5
				Sphaeralcea	5
				White bursage	5
				Spiny hopsage	5
				Popcornflower	5
				Owlclover	5
				Malacothrix	5
				Red brome	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
145 Manet	Cobbly Sandy(30f)	Favorable	400	Creosotebush	20
		Normal	200	Filaree	10
		Unfavorable	100	Desert needlegrass	10
				Indian ricegrass	5
				Mediterranean schismus	5
				Buckwheat	5
				Yucca	5
				Nevada ephedra	5
				Red brome	5
146, 147 Manet	Sandy(30f,g)	Favorable	300	Indian ricegrass	20
		Normal	200	Creosotebush	15
		Unfavorable	50	Mediterranean schismus	10
				Filaree	10
				Gilia	5
				Sphaeralcea	5
				White bursage	5
				Spiny hopsage	5
				Popcornflower	5
				Owlclover	5
				Malacothrix	5
				Red brome	5
148 Mirage	Desert Pavement(30g)	Favorable	200	Creosotebush	20
		Normal	100	Mediterranean schismus	10
		Unfavorable	25	Filaree	10
				White bursage	5
				Cactus	5
				Gilia	5
				Annual lotus	5
				Malacothrix	5
149*:					
Mirage	Desert Pavement(30g)	Favorable	200	Creosotebush	20
		Normal	100	Mediterranean schismus	10
		Unfavorable	25	Filaree	10
				White bursage	5
				Cactus	5
				Gilia	5
				Annual lotus	5
				Malacothrix	5
Joshua	Desert Pavement(30g)	Favorable	300	Filaree	20
		Normal	150	Creosotebush	20
		Unfavorable	50	Mediterranean schismus	10
				White bursage	5
				Gilia	5
				Annual lotus	5
				Malacothrix	5
150 Mohave Variant	Sandy(30f)	Favorable	300	Creosotebush	15
		Normal	100	Buckwheat	10
		Unfavorable	50	Mediterranean schismus	10
				Filaree	10
				Indian ricegrass	10
				Pepperweed	5
				Desert needlegrass	5
				Wallflower	5
				White bursage	5
				Spiny hopsage	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
151*:					
Nebona	Desert Pavement(30f,g)	Favorable	150	Creosotebush	25
		Normal	100	Mediterranean schismus	10
		Unfavorable	25	Filaree	10
				White bursage	5
				Buckwheat	5
				Desert indianwheat	5
				Gilia	5
				Bush senecio	5
Cuddeback	Desert Pavement(30g)	Favorable	200	Creosotebush	20
		Normal	100	Mediterranean schismus	10
		Unfavorable	25	Filaree	10
				Mohave yucca	5
				White bursage	5
				Cactus	5
				Gilia	5
				Annual lotus	5
				Malacothrix	5
152*:					
Norob	Alkali Sandy(30f,g)	Favorable	200	Creosotebush	15
		Normal	100	Allscale saltbush	10
		Unfavorable	25	Pepperweed	10
				Mediterranean schismus	10
				Filaree	10
				Indian ricegrass	5
				Desert sage	5
				Phacelia	5
				Nevada ephedra	5
Halloran	Alkali Sandy(30f,g)	Favorable	200	Creosotebush	20
		Normal	100	Mediterranean schismus	15
		Unfavorable	25	Allscale saltbush	15
				Filaree	10
				White bursage	10
				Primrose	5
				Goldenbush	5
				Cactus	5
				Mojave seablite	5
				Fourwing saltbush	5
153 Peterman	Limy Loam(30f,g)	Favorable	250	Shadscale	30
		Normal	150	Allscale saltbush	10
		Unfavorable	75	Brome	10
				Filaree	10
				Wallflower	5
				Malacothrix	5
				Sphaeralcea	5
				Desert needlegrass	5
				Desert alyssum	5
154 Peterman	Alkali Clayey(30f,g)	Favorable	400	Allscale saltbush	20
		Normal	200	Shadscale	10
		Unfavorable	50	Brome	10
				Horsebrush	10
				Filaree	5
				Princesplume	5
				Desert alyssum	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
159, 160 Rosamond	Saline Alkali Flats(30f)	Favorable	400	Filaree	15
		Normal	200	Brome	15
		Unfavorable	50	Allscale saltbush	10
				Wallflower	10
				Desert alyssum	10
				Malacothrix	5
				Sphaeralcea	5
161 Soboba	Coarse Loamy(30e)	Favorable	1,200	Desert needlegrass	15
		Normal	700	Red brome	10
		Unfavorable	500	California buckwheat	10
				Filaree	5
				Cheatgrass	5
				Joshua-tree	5
				Nevada ephedra	5
				California juniper	5
				Bluegrass	5
162*:					
Sparkhule	Gravelly Loam(30f,g)	Favorable	300	Filaree	15
		Normal	100	Phacelia	10
		Unfavorable	50	Mediterranean schismus	10
				Desert needlegrass	10
				Creosotebush	5
				Mojave cottonthorn	5
				Red brome	5
				California buckwheat	5
				Desert alyssum	5
				Nevada ephedra	5
				Sphaeralcea	5
				Shadscale	5
				Winterfat	5
Rock outcrop.					
164 Trigger	Gravelly Loam(30f,g)	Favorable	200	Mediterranean schismus	20
		Normal	100	Buckwheat	15
		Unfavorable	50	Creosotebush	10
				Red brome	10
				Nevada ephedra	5
				Filaree	5
				Shadscale	5
				Desert needlegrass	5
				Winterfat	5
				Desert alyssum	5
				Malacothrix	5
				Dalea	5
165*:					
Trigger	Gravelly Loam(30f,g)	Favorable	200	Mediterranean schismus	20
		Normal	100	Buckwheat	15
		Unfavorable	50	Creosotebush	10
				Red brome	10
				Nevada ephedra	5
				Filaree	5
				Shadscale	5
				Desert needlegrass	5
				Winterfat	5
				Desert alyssum	5
				Malacothrix	5
				Dalea	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
165*:					
Sparkhule	Gravelly Loam(30f,g)	Favorable	300	Filaree	15
		Normal	100	Phacelia	10
		Unfavorable	50	Mediterranean schismus	10
				Desert needlegrass	10
				Creosotebush	5
				Mojave cottonthorn	5
				Red brome	5
				California buckwheat	5
				Desert alyssum	5
				Nevada ephedra	5
				Sphaeralcea	5
				Shadscale	5
				Winterfat	5
Rock outcrop.					
166*:					
Trigger	Gravelly Loam(30f,g)	Favorable	200	Mediterranean schismus	20
		Normal	100	Buckwheat	15
		Unfavorable	50	Creosotebush	10
				Red brome	10
				Nevada ephedra	5
				Filaree	5
				Shadscale	5
				Desert needlegrass	5
				Winterfat	5
				Desert alyssum	5
				Malacothrix	5
				Dalea	5
Rock outcrop.					
167 Tujunga	Coarse Loamy(30e)	Favorable	1,200	Desert needlegrass	10
		Normal	700	Rabbitbrush	10
		Unfavorable	500	Brome	10
				Red brome	5
				Filaree	5
				California buckwheat	5
				Joshua-tree	5
				Bush senecio	5
				Bluegrass	5
				California juniper	5
				Desert almond	5
				Desert sage	5
168*:					
Typic Haplargids.					
Yermo	Gravelly Coarse Loamy(30f,g)	Favorable	400	Creosotebush	20
		Normal	200	Mediterranean schismus	10
		Unfavorable	100	Blackbush	10
				Desert needlegrass	5
				Red brome	5
				White bursage	5
				Yucca	5
				Filaree	5
				Desert indianwheat	5
				Wallflower	5
				Cactus	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
169: Victorville	Coarse Loamy Bottom(30f,g)	Favorable	1,500	Brome	15
		Normal	1,000	Mediterranean schismus	10
		Unfavorable	500	Big saltbush	10
				Fremont cottonwood	5
				Wallflower	5
				Filaree	5
				Willow	5
				Inland saltgrass	5
				Saltbush	5
				Goldenbush	5
170: Victorville Variant	Alkali Sandy(30f,g)	Favorable	200	Allscale saltbush	20
		Normal	100	Creosotebush	20
		Unfavorable	50	Fourwing saltbush	10
				Pepperweed	10
				Mediterranean schismus	5
				Boxthorn	5
				Wallflower	5
				Phacelia	5
171, 172: Villa	Coarse Loamy Bottom(30f,g)	Favorable	1,800	Inland saltgrass	15
		Normal	1,400	Fremont cottonwood	10
		Unfavorable	900	Big saltbush	10
				Willow	10
				Beardless wildrye	5
				Saltbush	5
				Mediterranean schismus	5
				Saltcedar	5
173, 174: Wasco	Coarse Loamy(30f,g)	Favorable	500	Creosotebush	15
		Normal	200	Mediterranean schismus	10
		Unfavorable	100	Filaree	10
				Red brome	10
				White bursage	5
				Nevada ephedra	5
				Desert alyssum	5
				Saltbush	5
				Mojave cottonthorn	5
175*:					
Wrightwood	Sandy(20e)	Favorable	1,200	Shrub live oak	20
		Normal	700	Squirreltail	10
		Unfavorable	400	Desert needlegrass	10
				Chamise	10
				Tansymustard	5
				Buckwheat	5
				Manzanita	5
				Red brome	5
				Filaree	5
				Mediterranean schismus	5
Bull Trail	Coarse Loamy(20e)	Favorable	1,800	Desert needlegrass	15
		Normal	800	California juniper	15
		Unfavorable	400	Filaree	10
				Bluegrass	10
				Red brome	5
				Shrub live oak	5
				California buckwheat	5
				Rubber rabbitbrush	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
176----------------- Yermo	Gravelly Coarse Loamy(30f,g)--	Favorable	400	Creosotebush------------------	20
		Normal	200	Mediterranean schismus--------	10
		Unfavorable	100	Blackbrush--------------------	10
				Desert needlegrass------------	5
				Red brome---------------------	5
				White bursage-----------------	5
				Yucca-------------------------	5
177*:					
Yermo-------------	Cobbly Sandy(30f,g)-----------	Favorable	500	Desert needlegrass------------	10
		Normal	300	Cactus------------------------	5
		Unfavorable	100	Red brome---------------------	5
				Galleta-----------------------	5
				Creosotebush------------------	5
				Mohave yucca------------------	5
				Nevada ephedra----------------	5
				Desert sage-------------------	5
				Mojave cottonthorn------------	5
				Buckwheat---------------------	5
				Wallflower--------------------	5
Kimberlina--------	Gravelly Coarse Loamy(30f)----	Favorable	400	Creosotebush------------------	25
		Normal	200	Mediterranean schismus--------	15
		Unfavorable	50	Filaree-----------------------	10
				White bursage-----------------	10
				Boxthorn----------------------	10
				Desert alyssum----------------	5
				Dalea-------------------------	5
				Red brome---------------------	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
100 Arizo	Severe: floods.	Moderate: small stones.	Severe: small stones.	Slight	Severe: droughty.
101*:					
Arrastre	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
102*:					
Avawatz	Severe: floods.	Moderate: soil blowing.	Moderate: slope, small stones, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
Oak Glen	Severe: floods.	Slight	Moderate: slope, small stones.	Slight	Slight.
103*. Badland					
104 Bousic	Severe: floods, excess sodium, excess salt.	Severe: excess sodium, excess salt, dusty.	Severe: excess sodium, excess salt, dusty.	Severe: erodes easily, dusty.	Severe: excess salt, excess sodium, droughty.
105 Bryman	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: small stones, soil blowing.	Moderate: soil blowing.	Slight.
106 Bryman	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: slope, small stones, soil blowing.	Moderate: soil blowing.	Slight.
107 Bryman	Moderate: soil blowing.	Moderate: soil blowing.	Severe: slope.	Moderate: soil blowing.	Slight.
108 Bryman	Moderate: slope, soil blowing.	Moderate: slope, soil blowing.	Severe: slope.	Moderate: soil blowing.	Moderate: slope.
109 Bryman	Severe: floods.	Slight	Slight	Slight	Slight.
110*:					
Bryman	Severe: too sandy.	Severe: too sandy.	Severe: slope, small stones, too sandy.	Severe: too sandy.	Moderate: small stones, large stones, droughty.
Cajon	Severe: too sandy.	Severe: too sandy.	Severe: small stones.	Severe: too sandy.	Severe: droughty.
111*:					
Bull Trail	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Typic Xerorthents.					
112, 113 Cajon	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
114-------------------- Cajon	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
115-------------------- Cajon	Severe: floods, too sandy.	Severe: too sandy.	Severe: small stones, slope.	Severe: too sandy.	Severe: droughty.
116-------------------- Cajon	Moderate: soil blowing.	Moderate: soil blowing.	Severe: slope.	Slight------------	Moderate: droughty.
117-------------------- Cajon	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: small stones.	Moderate: soil blowing.	Moderate: droughty.
118*:					
Cajon----------------	Severe: floods, too sandy.	Severe: too sandy.	Severe: small stones, slope.	Severe: too sandy.	Severe: droughty.
Arizo----------------	Severe: floods.	Moderate: small stones.	Severe: small stones.	Slight------------	Severe: droughty.
119*:					
Cajon----------------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
Wasco----------------	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: slope, small stones, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
120-------------------- Cave	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Moderate: dusty.	Severe: thin layer.
121*:					
Crafton--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sheephead------------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
Rock outcrop.					
122*:					
Cushenbury-----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Crafton--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
123*. Dune land					
124*. Fluvents					
125-------------------- Glendale Variant	Severe: floods, excess salt, excess sodium.	Severe: excess salt, excess sodium.	Severe: excess salt, excess sodium.	Severe: erodes easily.	Severe: excess salt, excess sodium.
126*: Gullied land.					

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
126*: Haploxeralfs.					
127----------------- Halloran	Severe: floods, too sandy, excess sodium.	Severe: too sandy, excess sodium, excess salt.	Severe: too sandy, excess sodium, excess salt.	Severe: too sandy.	Severe: excess salt, excess sodium, droughty.
128*: Halloran-----------	Severe: floods, too sandy, excess sodium.	Severe: too sandy, excess sodium, excess salt.	Severe: too sandy, excess sodium, excess salt.	Severe: too sandy.	Severe: excess salt, excess sodium, droughty.
Dune land.					
129----------------- Hanford	Severe: floods.	Moderate: soil blowing.	Moderate: slope, small stones, soil blowing.	Moderate: soil blowing.	Slight.
130*: Haplargids.					
Calciorthids.					
131----------------- Helendale	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: small stones, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
132----------------- Helendale	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: slope, small stones, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
133*: Helendale----------	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: slope, small stones, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
Bryman--------------	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: slope, small stones, soil blowing.	Moderate: soil blowing.	Slight.
134----------------- Hesperia	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: slope, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
135----------------- Joshua	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: small stones, excess sodium, excess salt.	Severe: erodes easily.	Severe: droughty, excess sodium.
136----------------- Joshua	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: slope, small stones, excess sodium.	Severe: erodes easily.	Severe: droughty, excess sodium.
137----------------- Kimberlina	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: small stones.	Moderate: soil blowing.	Moderate: droughty.
138----------------- Kimberlina	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: small stones, slope.	Moderate: soil blowing.	Moderate: droughty.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
139------------------- Kimberlina	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight------------	Moderate: small stones, droughty.
140------------------- Lavic	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: slope, small stones, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
141------------------- Lovelace	Moderate: soil blowing.	Moderate: soil blowing.	Severe: slope.	Moderate: soil blowing.	Moderate: droughty.
142------------------- Lucerne	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: small stones, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
143------------------- Lucerne	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: slope, small stones, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
144------------------- Manet	Severe: floods, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
145------------------- Manet	Severe: floods, too sandy.	Severe: too sandy.	Severe: large stones, too sandy.	Severe: too sandy.	Severe: large stones, droughty.
146, 147-------------- Manet	Severe: floods.	Moderate: soil blowing.	Moderate: small stones.	Moderate: soil blowing.	Moderate: droughty.
148------------------- Mirage	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: small stones, excess sodium, excess salt.	Slight------------	Severe: droughty, excess sodium.
149*:					
Mirage---------------	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: small stones, excess sodium, excess salt.	Slight------------	Severe: droughty, excess sodium.
Joshua---------------	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: small stones, excess sodium, excess salt.	Severe: erodes easily.	Severe: droughty, excess sodium.
150------------------- Mohave Variant	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: soil blowing.	Slight.
151*:					
Nebona---------------	Severe: cemented pan, excess sodium, excess salt.	Severe: cemented pan, excess sodium, excess salt.	Severe: cemented pan, excess sodium, excess salt.	Slight------------	Severe: droughty, excess salt, excess sodium.
Cuddeback------------	Moderate: small stones, excess salt.	Moderate: small stones, excess salt.	Severe: small stones.	Slight------------	Moderate: droughty, thin layer.
152*:					
Norob----------------	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Moderate: soil blowing.	Severe: excess sodium.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
152*:					
Halloran	Severe: too sandy, excess sodium, excess salt.	Severe: too sandy, excess sodium, excess salt.	Severe: too sandy, excess sodium, excess salt.	Severe: too sandy.	Severe: excess salt, excess sodium, droughty.
153 Peterman	Severe: excess salt, excess sodium.	Severe: excess salt, excess sodium.	Severe: excess salt, excess sodium.	Moderate: dusty.	Severe: excess sodium.
154 Peterman	Severe: floods, excess sodium, excess salt.	Severe: excess salt, excess sodium.	Severe: too clayey, excess salt, excess sodium.	Moderate: too clayey, dusty.	Severe: excess sodium, too clayey.
155*. Pits					
156*. Playas					
157*. Riverwash					
158*:					
Rock outcrop.					
Lithic Torriorthents.					
159 Rosamond	Severe: floods, excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: erodes easily.	Severe: excess salt, excess sodium.
160 Rosamond	Severe: floods, excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: erodes easily.	Severe: excess salt, excess sodium.
161 Soboba	Severe: floods.	Moderate: small stones.	Severe: large stones.	Severe: too sandy.	Severe: droughty.
162*:					
Sparkhule	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
163*:					
Torriorthents.					
Torripsamments.					
Urban land.					
164 Trigger	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: dusty.	Severe: thin layer.
165*:					
Trigger	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
165*:					
Sparkhule	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
166*:					
Trigger	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
167 Tujunga	Severe: floods, too sandy.	Severe: too sandy.	Moderate: slope, floods.	Severe: too sandy.	Moderate: droughty, floods.
168*:					
Typic Haplargids.					
Yermo	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
169 Victorville	Severe: floods.	Moderate: soil blowing.	Moderate: small stones, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
170 Victorville Variant	Severe: floods, too sandy, excess sodium.	Severe: too sandy, excess sodium, excess salt.	Severe: too sandy, excess sodium, excess salt.	Severe: too sandy.	Severe: excess salt, excess sodium, droughty.
171, 172 Villa	Severe: floods.	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: droughty.
173 Wasco	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: small stones, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
174 Wasco	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: slope, small stones, soil blowing.	Moderate: soil blowing.	Moderate: droughty.
175*:					
Wrightwood	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Bull Trail	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
176 Yermo	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
177*:					
Yermo	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.	Severe: slope.
Kimberlina	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
100: Arizo	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: droughty.
101*:						
Arrastre	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
102*:						
Avawatz	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: droughty.
Oak Glen	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Slight.
103*. Badland						
104: Bousic	Moderate: too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess salt, excess sodium, droughty.
105, 106: Bryman	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
107: Bryman	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Slight.
108: Bryman	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, shrink-swell.	Moderate: slope.
109: Bryman	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, shrink-swell.	Slight.
110*:						
Bryman	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, shrink-swell.	Moderate: small stones, large stones, droughty.
Cajon	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
111*:						
Bull Trail	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Typic Xerorthents.						
112: Cajon	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
113: Cajon	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty, too sandy.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
114----------------- Cajon	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
115----------------- Cajon	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods, slope.	Moderate: slope, floods.	Severe: droughty.
116----------------- Cajon	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
117----------------- Cajon	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
118*:						
Cajon-------------	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods, slope.	Moderate: slope, floods.	Severe: droughty.
Arizo-------------	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: droughty.
119*:						
Cajon-------------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty, too sandy.
Wasco-------------	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
120----------------- Cave	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: thin layer.
121*:						
Crafton-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sheephead---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.						
122*:						
Cushenbury--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Crafton-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
123*. Dune land						
124*. Fluvents						
125----------------- Glendale Variant	Slight---------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Severe: excess salt, excess sodium.
126*:						
Gullied land.						
Haploxeralfs.						

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
127---------------- Halloran	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Severe: excess salt, excess sodium, droughty.
128*:						
Halloran---------	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Severe: excess salt, excess sodium, droughty.
Dune land.						
129---------------- Hanford	Slight---------	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Slight.
130*: Haplargids.						
Calciorthids.						
131, 132---------- Helendale	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
133*: Helendale--------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
Bryman-----------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
134---------------- Hesperia	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
135---------------- Joshua	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: droughty, excess sodium.
136---------------- Joshua	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty, excess sodium.
137, 138---------- Kimberlina	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
139---------------- Kimberlina	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: small stones, droughty.
140---------------- Lavic	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
141---------------- Lovelace	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
142, 143---------- Lucerne	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
144---------------- Manet	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Severe: too sandy.
145---------------- Manet	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: large stones, droughty.
146, 147---------- Manet	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: droughty.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
148---------------- Mirage	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: droughty, excess sodium.
149*:						
Mirage-----------	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: droughty, excess sodium.
Joshua-----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: droughty, excess sodium.
150---------------- Mohave Variant	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
151*:						
Nebona-----------	Severe: cemented pan, cutbanks cave.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: droughty, excess salt, excess sodium.
Cuddeback--------	Severe: cemented pan, cutbanks cave.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: slope, cemented pan.	Moderate: cemented pan.	Moderate: droughty, thin layer.
152*:						
Norob------------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Severe: excess sodium.
Halloran---------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: excess salt, excess sodium, droughty.
153---------------- Peterman	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess sodium.
154---------------- Peterman	Moderate: too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess sodium, too clayey.
155*. Pits						
156*. Playas						
157*. Riverwash						
158*: Rock outcrop.						
Lithic Torriorthents.						
159---------------- Rosamond	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Severe: excess salt, excess sodium.
160---------------- Rosamond	Slight---------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Severe: excess salt, excess sodium.
161---------------- Soboba	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: droughty.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
162*:						
Sparkhule--------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
163*:						
Torriorthents.						
Torripsamments.						
Urban land.						
164--------------- Trigger	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
165*:						
Trigger----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Sparkhule--------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
166*:						
Trigger----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
167--------------- Tujunga	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: droughty, floods.
168*:						
Typic Haplargids.						
Yermo------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
169--------------- Victorville	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: droughty.
170--------------- Victorville Variant	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Severe: excess salt, excess sodium, droughty.
171, 172---------- Villa	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: droughty.
173, 174---------- Wasco	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
175*:						
Wrightwood-------	Slight---------	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
Bull Trail-------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
176----------------- Yermo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
177*:						
Yermo-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
177*:						
Kimberlina--------	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: small stones, droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
100 Arizo	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, too sandy.	Severe: floods.	Poor: seepage, too sandy, small stones.
101*:					
Arrastre	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope.
Rock outcrop.					
102*:					
Avawatz	Severe: poor filter.	Severe: seepage, floods.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Oak Glen	Moderate: floods.	Severe: seepage, floods.	Severe: seepage.	Severe: seepage.	Good.
103*. Badland					
104 Bousic	Severe: percs slowly.	Severe: floods.	Severe: excess salt.	Moderate: floods.	Poor: hard to pack.
105, 106 Bryman	Severe: percs slowly, poor filter.	Severe: seepage.	Slight	Slight	Fair: thin layer.
107 Bryman	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Slight	Slight	Fair: thin layer.
108 Bryman	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: slope, thin layer.
109 Bryman	Severe: percs slowly, poor filter.	Severe: seepage, floods.	Moderate: floods.	Moderate: floods.	Fair: thin layer.
110*:					
Bryman	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope, thin layer.
Cajon	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
111*:					
Bull Trail	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Typic Xerorthents.					

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
112, 113----------- Cajon	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight-----------	Poor: seepage, too sandy.
114---------------- Cajon	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: seepage, too sandy.
115---------------- Cajon	Severe: poor filter.	Severe: seepage, floods, slope.	Severe: too sandy.	Moderate: floods, slope.	Poor: seepage, too sandy.
116---------------- Cajon	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Slight-----------	Poor: seepage, too sandy.
117---------------- Cajon	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Slight-----------	Poor: seepage.
118*:					
Cajon--------------	Severe: poor filter.	Severe: seepage, floods, slope.	Severe: too sandy.	Moderate: floods, slope.	Poor: seepage, too sandy.
Arizo--------------	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, too sandy.	Severe: floods.	Poor: seepage, too sandy, small stones.
119*:					
Cajon--------------	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight-----------	Poor: seepage, too sandy.
Wasco--------------	Slight-----------	Severe: seepage.	Slight-----------	Slight-----------	Good.
120---------------- Cave	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim, small stones.
121*:					
Crafton------------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope.
Sheephead----------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope.
Rock outcrop.					
122*:					
Cushenbury---------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope.
Crafton------------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope.
Rock outcrop.					

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
123*. Dune land					
124*. Fluvents					
125 Glendale Variant	Severe: percs slowly.	Severe: floods.	Severe: excess salt.	Moderate: floods.	Poor: excess salt.
126*: Gullied land.					
Haploxeralfs.					
127 Halloran	Moderate: floods.	Severe: seepage, floods.	Severe: too sandy, excess salt.	Moderate: floods.	Poor: too sandy.
128*: Halloran	Moderate: floods.	Severe: seepage, floods.	Severe: too sandy, excess salt.	Moderate: floods.	Poor: too sandy.
Dune land.					
129 Hanford	Moderate: floods.	Severe: seepage, floods.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
130*: Haplargids.					
Calciorthids.					
131, 132 Helendale	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Slight	Fair: too sandy.
133*: Helendale	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Slight	Fair: too sandy.
Bryman	Severe: percs slowly, poor filter.	Severe: seepage.	Slight	Slight	Fair: thin layer.
134 Hesperia	Slight	Severe: seepage.	Slight	Slight	Good.
135 Joshua	Severe: percs slowly.	Moderate: slope.	Moderate: too sandy.	Slight	Poor: seepage, small stones.
136 Joshua	Severe: percs slowly.	Severe: slope.	Moderate: slope, too sandy.	Moderate: slope.	Poor: seepage, small stones.
137, 138 Kimberlina	Slight	Severe: seepage.	Slight	Slight	Good.
139 Kimberlina	Slight	Severe: seepage.	Slight	Slight	Fair: small stones.
140 Lavic	Severe: poor filter.	Severe: seepage.	Slight	Slight	Fair: thin layer.
141 Lovelace	Moderate: percs slowly.	Severe: seepage, slope.	Severe: too sandy.	Slight	Poor: too sandy.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
142, 143----------- Lucerne	Slight-----------	Severe: seepage.	Slight-----------	Slight-----------	Good.
144----------------- Manet	Moderate: floods.	Severe: seepage, floods.	Severe: too sandy.	Moderate: floods.	Poor: seepage, too sandy.
145----------------- Manet	Severe: floods.	Severe: seepage, floods.	Severe: floods, too sandy.	Severe: floods.	Poor: seepage, too sandy.
146----------------- Manet	Severe: percs slowly.	Severe: seepage, floods.	Severe: too sandy.	Moderate: floods.	Poor: seepage, too sandy.
147----------------- Manet	Moderate: floods.	Severe: seepage, floods.	Severe: too sandy.	Moderate: floods.	Poor: seepage, too sandy.
148----------------- Mirage	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: too sandy, excess salt.	Slight-----------	Poor: seepage, too sandy, small stones.
149*:					
Mirage-------------	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: too sandy, excess salt.	Slight-----------	Poor: seepage, too sandy, small stones.
Joshua-------------	Severe: percs slowly.	Moderate: slope.	Moderate: too sandy.	Slight-----------	Poor: seepage, small stones.
150----------------- Mohave Variant	Severe: percs slowly, poor filter.	Severe: seepage.	Moderate: too sandy.	Slight-----------	Fair: too sandy.
151*:					
Nebona-------------	Severe: cemented pan.	Severe: seepage, cemented pan.	Severe: cemented pan, too sandy.	Severe: cemented pan.	Poor: area reclaim, seepage, too sandy.
Cuddeback----------	Severe: cemented pan.	Severe: seepage, cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
152*:					
Norob--------------	Severe: percs slowly.	Severe: seepage.	Slight-----------	Slight-----------	Good.
Halloran-----------	Slight-----------	Severe: seepage.	Severe: too sandy, excess salt.	Slight-----------	Poor: too sandy.
153----------------- Peterman	Severe: percs slowly.	Slight-----------	Severe: excess salt.	Slight-----------	Poor: hard to pack.
154----------------- Peterman	Severe: percs slowly.	Severe: floods.	Severe: excess salt.	Moderate: floods.	Poor: hard to pack.
155*. Pits					
156*. Playas					

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
157*. Riverwash					
158*: Rock outcrop.					
Lithic Torriorthents.					
159 Rosamond	Severe: percs slowly.	Severe: seepage, floods.	Moderate: floods.	Moderate: floods.	Good.
160 Rosamond	Severe: percs slowly.	Severe: floods.	Severe: excess salt.	Moderate: floods.	Good.
161 Soboba	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, seepage, too sandy.	Severe: floods, seepage.	Poor: seepage, too sandy, small stones.
162*: Sparkhule	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
163*: Torriorthents.					
Torripsamments.					
Urban land.					
164 Trigger	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
165*: Trigger	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Sparkhule	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
166*: Trigger	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					
167 Tujunga	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, seepage, too sandy.	Severe: floods, seepage.	Poor: seepage, too sandy.
168*: Typic Haplargids.					

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
168*:					
Yermo	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: seepage, small stones, slope.
169 Victorville	Severe: percs slowly.	Severe: seepage, floods.	Moderate: floods.	Moderate: floods.	Good.
170 Victorville Variant	Severe: poor filter.	Severe: seepage, floods.	Severe: too sandy.	Moderate: floods.	Poor: too sandy.
171, 172 Villa	Severe: wetness.	Severe: seepage, floods, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
173, 174 Wasco	Slight	Severe: seepage.	Slight	Slight	Good.
175*:					
Wrightwood	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Fair: small stones.
Bull Trail	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
176 Yermo	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: seepage, small stones, slope.
177*:					
Yermo	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: seepage, small stones, slope.
Kimberlina	Slight	Severe: seepage.	Slight	Slight	Fair: small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
100 Arizo	Good	Probable	Probable	Poor: small stones, area reclaim.
101*:				
Arrastre	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop.				
102*:				
Avawatz	Good	Probable	Improbable: too sandy.	Fair: small stones.
Oak Glen	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
103*. Badland				
104 Bousic	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
105, 106, 107 Bryman	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
108 Bryman	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones, slope.
109 Bryman	Good	Probable	Improbable: too sandy.	Fair: too clayey.
110*:				
Bryman	Good	Probable	Probable	Poor: too sandy, small stones.
Cajon	Good	Probable	Probable	Poor: too sandy, small stones.
111*:				
Bull Trail	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Typic Xerorthents.				
112, 113, 114 Cajon	Good	Probable	Improbable: thin layer.	Poor: too sandy, small stones.
115 Cajon	Good	Probable	Probable	Poor: too sandy, small stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
116 Cajon	Good	Probable	Improbable: thin layer.	Poor: small stones.
117 Cajon	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy, small stones.
118*:				
Cajon	Good	Probable	Probable	Poor: too sandy, small stones.
Arizo	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
119*:				
Cajon	Good	Probable	Improbable: thin layer.	Poor: too sandy, small stones.
Wasco	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
120 Cave	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
121*:				
Crafton	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sheephead	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
122*:				
Cushenbury	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Crafton	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop.				
123*. Dune land				
124*. Fluvents				
125 Glendale Variant	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
126*: Gullied land.				
Haploxeralfs.				
127 Halloran	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
128*:				
Halloran	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
Dune land.				
129 Hanford	Good	Probable	Probable	Fair: small stones, area reclaim.
130*:				
Haplargids.				
Calciorthids.				
131, 132 Helendale	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
133*:				
Helendale	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
Bryman	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
134 Hesperia	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
135, 136 Joshua	Good	Probable	Probable	Poor: small stones, area reclaim, excess sodium.
137, 138 Kimberlina	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
139 Kimberlina	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
140 Lavic	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
141 Lovelace	Good	Probable	Improbable: excess fines.	Fair: too sandy, small stones, thin layer.
142, 143 Lucerne	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
144 Manet	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
145 Manet	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, small stones.
146 Manet	Fair: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy, small stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
147 Manet	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: small stones.
148 Mirage	Good	Probable	Probable	Poor: small stones, area reclaim, excess sodium.
149*:				
Mirage	Good	Probable	Probable	Poor: small stones, area reclaim, excess sodium.
Joshua	Good	Probable	Probable	Poor: small stones, area reclaim, excess sodium.
150 Mohave Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
151*:				
Nebona	Poor: area reclaim.	Probable	Probable	Poor: small stones, area reclaim, excess sodium.
Cuddeback	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
152*:				
Norob	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
Halloran	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
153 Peterman	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
154 Peterman	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
155*. Pits				
156*. Playas				
157*. Riverwash				
158*: Rock outcrop.				
Lithic Torriorthents.				
159 Rosamond	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
160: Rosamond	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
161: Soboba	Fair: large stones.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
162*:				
Sparkhule	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
163*:				
Torriorthents.				
Torripsamments.				
Urban land.				
164: Trigger	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
165*:				
Trigger	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Sparkhule	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
166*:				
Trigger	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
167: Tujunga	Good	Probable	Probable	Poor: too sandy, small stones.
168*:				
Typic Haplargids.				
Yermo	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
169: Victorville	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
170-------------------- Victorville Variant	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: excess sodium, small stones, excess salt.
171, 172-------------- Villa	Good-----------------	Probable-------------	Improbable: too sandy.	Fair: too sandy, small stones.
173, 174-------------- Wasco	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
175*:				
Wrightwood-----------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Bull Trail-----------	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
176-------------------- Yermo	Poor: slope.	Probable-------------	Probable-------------	Poor: small stones, area reclaim, slope.
177*:				
Yermo-----------------	Fair: slope.	Probable-------------	Probable-------------	Poor: small stones, area reclaim, slope.
Kimberlina-----------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions
100 Arizo	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, fast intake.	Large stones, too sandy.
101*: Arrastre	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Droughty, soil blowing.	Slope, depth to rock, soil blowing.
Rock outcrop.					
102*: Avawatz	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing, slope.	Too sandy, soil blowing.
Oak Glen	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, slope.	Favorable.
103*. Badland					
104 Bousic	Slight	Severe: excess sodium, excess salt.	Deep to water	Droughty, percs slowly, excess sodium.	Erodes easily, percs slowly.
105 Bryman	Severe: seepage.	Severe: thin layer.	Deep to water	Fast intake, soil blowing.	Soil blowing.
106, 107 Bryman	Severe: seepage.	Severe: thin layer.	Deep to water	Fast intake, soil blowing, slope.	Soil blowing.
108 Bryman	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Fast intake, soil blowing, slope.	Slope, soil blowing.
109 Bryman	Moderate: seepage.	Moderate: thin layer.	Deep to water	Favorable	Favorable.
110*: Bryman	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Droughty, fast intake, slope.	Slope.
Cajon	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, fast intake, slope.	Too sandy.
111*: Bull Trail	Severe: slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Slope, too sandy, soil blowing.
Typic Xerorthents.					
112, 113 Cajon	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.
114 Cajon	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
115---------------- Cajon	Severe: seepage, slope.	Severe: seepage.	Deep to water----	Droughty, fast intake, slope.	Slope, too sandy.
116---------------- Cajon	Severe: seepage.	Severe: seepage.	Deep to water----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.
117---------------- Cajon	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.
118*:					
Cajon-------------	Severe: seepage, slope.	Severe: seepage.	Deep to water----	Droughty, fast intake.	Slope, too sandy.
Arizo-------------	Severe: seepage.	Severe: seepage.	Deep to water----	Large stones, droughty, fast intake.	Large stones, too sandy.
119*:					
Cajon-------------	Severe: seepage.	Severe: seepage.	Deep to water----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.
Wasco-------------	Severe: seepage.	Severe: piping.	Deep to water----	Droughty, soil blowing, slope.	Soil blowing.
120---------------- Cave	Severe: cemented pan.	Slight------------	Deep to water----	Cemented pan------	Cemented pan.
121*:					
Crafton-----------	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water----	Droughty, depth to rock, slope.	Slope, depth to rock.
Sheephead---------	Severe: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water----	Droughty, depth to rock, slope.	Slope, depth to rock.
Rock outcrop.					
122*:					
Cushenbury--------	Severe: seepage, slope.	Severe: thin layer.	Deep to water----	Droughty, soil blowing, slope.	Slope, depth to rock, soil blowing.
Crafton-----------	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water----	Droughty, depth to rock, slope.	Slope, depth to rock.
Rock outcrop.					
123*. Dune land					
124*. Fluvents					
125---------------- Glendale Variant	Slight------------	Severe: excess salt, excess sodium.	Deep to water----	Erodes easily, excess salt, excess sodium.	Erodes easily.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions
126*:					
Gullied land.					
Haploxeralfs.					
127---------------- Halloran	Severe: seepage.	Severe: seepage, piping, excess sodium.	Deep to water----	Soil blowing, excess sodium, excess salt.	Too sandy, soil blowing.
128*:					
Halloran---------	Severe: seepage.	Severe: seepage, piping, excess sodium.	Deep to water----	Soil blowing, excess sodium, excess salt.	Too sandy, soil blowing.
Dune land.					
129---------------- Hanford	Severe: seepage.	Severe: piping.	Deep to water----	Soil blowing, slope.	Soil blowing.
130*:					
Haplargids.					
Calciorthids.					
131, 132---------- Helendale	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Droughty, fast intake, soil blowing.	Soil blowing.
133*:					
Helendale--------	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Droughty, fast intake, soil blowing.	Soil blowing.
Bryman-----------	Severe: seepage.	Severe: thin layer.	Deep to water----	Fast intake, soil blowing, slope.	Soil blowing.
134---------------- Hesperia	Severe: seepage.	Severe: piping.	Deep to water----	Droughty, fast intake, slope.	Soil blowing.
135---------------- Joshua	Moderate: slope.	Severe: seepage, excess sodium.	Deep to water----	Excess sodium, percs slowly, slope.	Erodes easily, too sandy.
136---------------- Joshua	Severe: slope.	Severe: seepage, excess sodium.	Deep to water----	Excess sodium, percs slowly, slope.	Slope, erodes easily, too sandy.
137, 138---------- Kimberlina	Severe: seepage.	Severe: piping.	Deep to water----	Droughty, fast intake, soil blowing.	Favorable.
139---------------- Kimberlina	Severe: seepage.	Severe: seepage.	Deep to water----	Droughty, slope.	Favorable.
140---------------- Lavic	Moderate: seepage.	Severe: piping.	Deep to water----	Droughty, fast intake, soil blowing.	Soil blowing.
141---------------- Lovelace	Severe: seepage.	Severe: seepage.	Deep to water----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
142 Lucerne	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing.
143 Lucerne	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing, slope.	Soil blowing.
144 Manet	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy.
145 Manet	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, slope.	Too sandy.
146 Manet	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.
147 Manet	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Erodes easily, too sandy.
148 Mirage	Severe: seepage.	Severe: seepage, excess salt, excess sodium.	Deep to water	Droughty, slope, excess sodium.	Too sandy.
149*:					
Mirage	Severe: seepage.	Severe: seepage, excess salt, excess sodium.	Deep to water	Droughty, slope, excess sodium.	Too sandy.
Joshua	Moderate: slope.	Severe: seepage, excess sodium.	Deep to water	Excess sodium, percs slowly, slope.	Erodes easily, too sandy.
150 Mohave Variant	Severe: seepage.	Severe: seepage, piping.	Deep to water	Fast intake, soil blowing.	Too sandy, soil blowing.
151*:					
Nebona	Severe: seepage, cemented pan.	Severe: seepage, excess sodium.	Deep to water	Excess sodium, cemented pan, slope.	Cemented pan, too sandy.
Cuddeback	Severe: seepage.	Severe: thin layer, seepage.	Deep to water	Droughty, cemented pan.	Cemented pan, too sandy.
152*:					
Norob	Moderate: seepage.	Severe: excess sodium.	Deep to water	Percs slowly, excess sodium, excess salt.	Soil blowing, percs slowly.
Halloran	Severe: seepage.	Severe: seepage, piping, excess sodium.	Deep to water	Droughty, soil blowing, excess sodium.	Too sandy, soil blowing.
153 Peterman	Slight	Severe: excess sodium, excess salt.	Deep to water	Percs slowly, excess sodium, excess salt.	Percs slowly.
154 Peterman	Slight	Severe: excess sodium, excess salt.	Deep to water	Slow intake, percs slowly, excess sodium.	Percs slowly.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions
155*. Pits					
156*. Playas					
157*. Riverwash					
158*: Rock outcrop.					
Lithic Torriorthents.					
159---------------- Rosamond	Moderate: seepage.	Severe: excess sodium.	Deep to water----	Erodes easily, excess salt, excess sodium.	Erodes easily.
160---------------- Rosamond	Slight------------	Severe: excess sodium, excess salt.	Deep to water----	Erodes easily, excess salt, excess sodium.	Erodes easily.
161---------------- Soboba	Severe: seepage.	Severe: seepage.	Deep to water----	Large stones, droughty, fast intake.	Large stones, too sandy.
162*: Sparkhule---------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water----	Depth to rock, slope.	Slope, depth to rock.
Rock outcrop.					
163*: Torriorthents.					
Torripsamments.					
Urban land.					
164---------------- Trigger	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water----	Droughty, depth to rock, slope.	Slope, depth to rock.
165*: Trigger-----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water----	Droughty, depth to rock, slope.	Slope, depth to rock.
Sparkhule---------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water----	Depth to rock, slope.	Slope, depth to rock.
Rock outcrop.					
166*: Trigger-----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water----	Droughty, depth to rock, slope.	Slope, depth to rock.
Rock outcrop.					
167---------------- Tujunga	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
168*: Typic Haplargids.					
Yermo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, large stones.
169 Victorville	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing.
170 Victorville Variant	Severe: seepage.	Severe: piping, excess sodium.	Deep to water	Fast intake, soil blowing, excess sodium.	Too sandy, soil blowing.
171, 172 Villa	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.
173 Wasco	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing.
174 Wasco	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing, slope.	Soil blowing.
175*:					
Wrightwood	Severe: seepage.	Severe: piping.	Deep to water	Droughty, fast intake, soil blowing.	Soil blowing.
Bull Trail	Severe: slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Slope, too sandy, soil blowing.
176 Yermo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, large stones.
177*:					
Yermo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, large stones.
Kimberlina	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Favorable.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
100--------------- Arizo	0-15	Gravelly loamy sand.	SP-SM, SM	A-1	0-5	55-80	50-75	25-50	5-20	---	NP
	15-60	Very gravelly loamy coarse sand.	GP-GM, GP	A-1	5-25	40-60	35-55	15-35	5-15	---	NP
101*:											
Arrastre---------	0-6	Sandy loam--------	SM	A-2, A-4	0	85-95	80-90	50-60	30-40	20-25	NP-5
	6-26	Sandy loam, gravelly sandy loam.	SM	A-1, A-2	0	70-95	60-85	40-60	20-35	20-25	NP-5
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
102*:											
Avawatz----------	0-15	Sandy loam--------	SM	A-2	0	80-100	75-95	50-70	25-35	20-25	NP-5
	15-60	Loamy sand--------	SM, SP-SM	A-1, A-2	0	80-100	75-95	40-60	5-25	---	NP
Oak Glen---------	0-22	Sandy loam--------	SM	A-2, A-4	0-5	90-100	75-95	50-80	30-50	20-25	NP-5
	22-60	Fine sandy loam, sandy loam, coarse sandy loam.	SM	A-2, A-4	0	90-100	75-95	50-80	30-50	20-25	NP-5
103*. Badland											
104--------------- Bousic	0-5	Clay--------------	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
	5-42	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
	42-60	Clay, silty clay	CH	A-7	0	100	100	90-100	80-95	50-75	25-45
105--------------- Bryman	0-9	Loamy fine sand	SM	A-1, A-2	0-5	85-100	85-95	45-65	15-35	---	NP
	9-12	Sandy loam--------	SM	A-2, A-4	0	95-100	90-100	55-65	25-40	20-25	NP-5
	12-32	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	90-100	70-90	35-70	25-40	10-20
	32-46	Sandy loam, loam	SM	A-2, A-4	0	95-100	90-100	55-65	25-50	20-25	NP-5
	46-99	Loamy sand, sand, coarse sandy loam.	SM, SP-SM	A-1, A-2, A-3	0	85-100	85-95	40-60	5-25	---	NP
106--------------- Bryman	0-9	Loamy fine sand	SM	A-1, A-2	0-5	85-100	85-95	45-65	15-35	---	NP
	9-43	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	90-100	70-90	35-70	25-40	10-20
	43-60	Sandy loam, loam	SM	A-2, A-4	0	95-100	90-100	55-65	25-50	20-25	NP-5
107, 108---------- Bryman	0-9	Loamy fine sand	SM	A-1, A-2	0-5	85-100	85-95	45-65	15-35	---	NP
	9-39	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	90-100	70-90	35-70	25-40	10-20
	39-60	Loamy sand, sand, coarse sandy loam.	SM, SP-SM	A-1, A-2, A-3	0	85-100	85-95	40-60	5-25	---	NP
109--------------- Bryman	0-6	Sandy clay loam	SC, SM-SC	A-6, A-2, A-4	0	95-100	95-100	70-90	30-50	25-40	5-15
	6-44	Sandy clay loam	SC	A-6	0	95-100	95-100	80-90	35-50	25-40	10-20
	44-60	Loamy sand, sand	SM, SP-SM	A-1, A-2, A-3	0	85-95	80-90	40-70	5-25	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
110*:											
Bryman	0-6	Stony sand	SP-SM	A-1	5-10	65-85	65-75	35-50	5-10	---	NP
	6-31	Gravelly sandy clay loam.	SC	A-6, A-2	0	70-85	60-75	50-65	25-40	25-40	10-20
	31-51	Gravelly sandy loam.	SM	A-2, A-1	0	70-90	60-75	35-50	15-30	20-25	NP-5
	51-60	Gravelly coarse sand.	SP-SM	A-1	5-10	60-80	60-70	30-50	5-10	---	NP
Cajon	0-6	Gravelly sand	SM, SP-SM	A-1, A-2, A-3	0	55-80	50-75	25-55	5-25	---	NP
	6-60	Gravelly sand, gravelly fine sand.	SM, SP-SM	A-1, A-2, A-3	0	55-80	50-75	25-55	5-25	---	NP
111*:											
Bull Trail	0-4	Sandy loam	SM	A-2, A-4	0-10	100	75-100	40-60	30-40	25-30	NP-5
	4-19	Sandy clay loam, loam, gravelly sandy clay loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0	80-100	65-95	50-80	30-60	25-35	5-15
	19-60	Stratified loamy sand to loam.	SM	A-2	0-5	80-100	75-95	40-60	25-35	25-30	NP-5
Typic Xerorthents.											
112 Cajon	0-7	Sand	SM, SP-SM	A-1, A-2, A-3	0	95-100	75-100	40-60	5-25	---	NP
	7-25	Sand, fine sand	SM, SP-SM	A-1, A-2, A-3	0	95-100	75-100	40-60	5-25	---	NP
	25-45	Gravelly sand, gravelly loamy sand.	SM, SP-SM	A-1	0	60-85	50-75	25-50	5-20	---	NP
	45-60	Stratified sand to loamy fine sand.	SM, SP-SM	A-1, A-2, A-3	0	95-100	75-100	40-60	5-25	---	NP
113 Cajon	0-6	Sand	SM, SP-SM	A-1, A-2, A-3	0	95-100	75-100	40-60	5-25	---	NP
	6-25	Sand, fine sand	SM, SP-SM	A-1, A-2, A-3	0	95-100	75-100	40-60	5-25	---	NP
	25-60	Gravelly sand, gravelly loamy sand.	SM, SP-SM	A-1	0	60-85	50-75	25-50	5-20	---	NP
114 Cajon	0-6	Sand	SM, SP-SM	A-1, A-2, A-3	0	95-100	75-100	40-60	5-25	---	NP
	6-42	Sand, fine sand	SM, SP-SM	A-1, A-2, A-3	0	95-100	75-100	40-60	5-25	---	NP
	42-60	Gravelly sand, gravelly loamy sand.	SM, SP-SM	A-1	0	60-85	50-75	25-50	5-20	---	NP
115 Cajon	0-8	Gravelly sand	SM, SP-SM	A-1, A-2, A-3	0	55-80	50-75	25-55	5-25	---	NP
	8-60	Gravelly sand, gravelly fine sand.	SM, SP-SM	A-1, A-2, A-3	0	55-80	50-75	25-55	5-25	---	NP
116 Cajon	0-6	Loamy sand	SM	A-2	0	95-100	75-100	50-80	10-30	---	NP
	6-30	Loamy sand, loamy fine sand, loamy coarse sand.	SM	A-2	0	95-100	75-100	50-80	10-30	---	NP
	30-60	Gravelly sand, gravelly loamy sand.	SM, SP-SM	A-1	0	60-85	50-75	25-50	5-20	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
117--------------- Cajon	0-7	Loamy sand--------	SM	A-1, A-2	0	95-100	75-100	40-60	10-30	---	NP
	7-20	Sand, fine sand	SM, SP-SM	A-1, A-2, A-3	0	95-100	75-100	40-60	5-25	---	NP
	20-42	Loamy sand, loamy fine sand, loamy coarse sand.	SM	A-2	0	95-100	75-100	50-80	10-30	---	NP
	42-60	Stratified sand to clay loam.	SM	A-2, A-4	0	100	100	50-70	30-50	20-25	NP-5
118*: Cajon-----------	0-6	Gravelly sand----	SM, SP-SM	A-1, A-2, A-3	0	55-80	50-75	25-55	5-25	---	NP
	6-60	Gravelly sand, gravelly fine sand.	SM, SP-SM	A-1, A-2, A-3	0	55-80	50-75	25-55	5-25	---	NP
Arizo------------	0-6	Gravelly loamy sand.	SP-SM, SM	A-1	0-5	55-80	50-75	25-50	5-20	---	NP
	6-60	Very gravelly loamy coarse sand.	GP-GM, GP	A-1	0-10	35-55	30-50	15-30	5-15	---	NP
119*: Cajon-----------	0-8	Sand-------------	SM, SP-SM	A-1, A-2, A-3	0	95-100	75-100	40-60	5-25	---	NP
	8-60	Sand, fine sand	SM, SP-SM	A-1, A-2, A-3	0	95-100	75-100	40-60	5-25	---	NP
Wasco------------	0-7	Sandy loam--------	SM	A-2, A-4	0	80-100	75-100	45-65	25-40	20-25	NP-5
	7-60	Sandy loam--------	SM	A-2, A-4	0	80-100	75-100	45-65	25-40	20-25	NP-5
120--------------- Cave	0-14	Loam--------------	CL-ML	A-4	0-5	80-100	75-95	65-90	50-70	25-30	5-10
	14-21	Indurated---------	---	---	---	---	---	---	---	---	---
	21-66	Stratified sand to loam.	SM	A-2, A-4	0	90-100	75-100	45-65	25-40	20-25	NP-5
121*: Crafton----------	0-10	Sandy loam--------	SM	A-2, A-4	0	90-100	75-95	50-70	25-50	20-30	NP-5
	10-35	Sandy loam, fine sandy loam, gravelly sandy loam.	SM	A-2, A-4	0-5	90-100	70-95	45-70	25-50	20-30	NP-5
	35	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sheephead--------	0-18	Gravelly sandy loam.	SM	A-2, A-1	0-15	80-95	60-75	35-55	15-35	20-25	NP-5
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
122*: Cushenbury-------	0-14	Loamy sand--------	SM	A-1	0-5	95-100	75-90	35-50	10-25	---	NP
	14-27	Sandy loam--------	SM	A-2	0-5	95-100	75-90	45-65	25-35	---	NP
	27-39	Gravelly sandy loam, sandy loam.	SM	A-1, A-2	0-5	75-100	60-85	40-65	20-35	---	NP
	39	Weathered bedrock	---	---	---	---	---	---	---	---	---
Crafton----------	0-10	Sandy loam--------	SM	A-2, A-4	0	90-100	75-95	50-70	25-50	20-30	NP-5
	10-35	Sandy loam, fine sandy loam, gravelly sandy loam.	SM	A-2, A-4	0-5	90-100	70-95	45-70	25-50	20-30	NP-5
	35	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
123*. Dune land											
124*. Fluvents											
125 Glendale Variant	0-11	Silt loam	ML	A-4	0	100	100	90-100	70-90	30-40	5-10
	11-40	Silty clay loam	ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-20
	40-60	Stratified loam to silty clay loam.	ML, CL-ML	A-4, A-6, A-7	0	100	100	85-95	65-80	25-45	5-15
126*: Gullied land.											
Haploxeralfs.											
127 Halloran	0-2	Sand	SP-SM, SP	A-1, A-2, A-3	0	95-100	90-100	45-70	0-10	---	NP
	2-21	Sandy loam	SM-SC	A-2	0	95-100	90-100	55-65	25-35	15-25	5-10
	21-33	Loamy sand	SM	A-1, A-2	0	95-100	90-100	45-70	15-25	---	NP
	33-60	Stratified sand to sandy loam.	SM	A-1, A-2	0	95-100	90-100	45-70	10-25	---	NP
128*: Halloran	0-2	Sand	SP-SM, SP	A-1, A-2, A-3	0	95-100	90-100	45-70	0-10	---	NP
	2-21	Sandy loam	SM-SC	A-2	0	95-100	90-100	55-65	25-35	15-25	5-10
	21-33	Loamy sand	SM	A-1, A-2	0	95-100	90-100	45-70	15-25	---	NP
	33-60	Stratified sand to sandy loam.	SM	A-1, A-2	0	95-100	90-100	45-70	10-25	---	NP
Dune land.											
129 Hanford	0-12	Sandy loam	SM	A-2, A-4	0	85-100	75-100	50-75	20-50	20-25	NP-5
	12-60	Fine sandy loam, sandy loam, coarse sandy loam.	SM	A-2, A-4	0	85-100	75-100	50-75	20-50	20-25	NP-5
130*: Haplargids.											
Calciorthids.											
131, 132 Helendale	0-4	Loamy sand	SM	A-1, A-2	0-5	80-100	75-95	40-60	15-25	---	NP
	4-30	Sandy loam, fine sandy loam.	SM	A-2	0	80-100	75-95	45-55	25-30	20-25	NP-5
	30-66	Sandy loam, loamy fine sand.	SM	A-1, A-2	0	80-100	75-95	40-60	15-25	---	NP
	66-106	Loamy sand, loamy fine sand, sandy loam.	SM	A-1, A-2	0	80-100	75-95	40-60	15-25	---	NP
133*: Helendale	0-6	Loamy sand	SM	A-1, A-2	0-5	80-100	75-95	40-60	15-25	---	NP
	6-30	Sandy loam, fine sandy loam.	SM	A-2	0	80-100	75-95	45-55	25-30	20-25	NP-5
	30-66	Sandy loam, loamy fine sand.	SM	A-1, A-2	0	80-100	75-95	40-60	15-25	---	NP
	66-106	Loamy sand, loamy fine sand, sandy loam.	SM	A-1, A-2	0	80-100	75-95	40-60	15-25	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
133*:											
Bryman----------	0-8	Loamy sand-------	SM	A-1, A-2	0-5	85-100	85-95	45-65	15-35	---	NP
	8-12	Sandy loam-------	SM	A-2, A-4	0	95-100	90-100	55-65	25-40	20-25	NP-5
	12-44	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	90-100	70-90	35-70	25-40	10-20
	44-60	Loamy sand, sand, coarse sandy loam.	SM, SP-SM	A-1, A-2, A-3	0	85-100	85-95	40-60	5-25	---	NP
134-------------- Hesperia	0-6	Loamy fine sand	SM	A-2	0	95-100	90-100	80-95	15-30	---	NP
	6-60	Sandy loam, coarse sandy loam.	SM	A-2, A-4	0	80-100	75-100	45-70	25-40	20-25	NP-5
135-------------- Joshua	0-3	Loam-------------	ML, CL-ML	A-4	5-10	85-100	85-100	60-80	50-70	20-30	NP-10
	3-20	Gravelly sandy clay loam, gravelly sandy loam.	SC, GC	A-2, A-6	0-5	60-85	50-75	40-60	20-45	25-35	10-15
	20-55	Very gravelly loamy coarse sand, very gravelly coarse sandy loam.	GP-GM, GM	A-1	5-10	35-60	25-50	15-40	5-25	---	NP
136-------------- Joshua	0-5	Loam-------------	ML, CL-ML	A-4	5-10	85-100	85-100	60-80	50-70	20-30	NP-10
	5-19	Gravelly sandy clay loam, gravelly sandy loam.	SC, GC	A-2, A-6	0-5	60-85	50-75	40-60	20-45	25-35	10-15
	19-50	Very gravelly loamy coarse sand, very gravelly coarse sandy loam.	GP-GM, GM	A-1	5-10	35-60	25-50	15-40	5-25	---	NP
137-------------- Kimberlina	0-7	Loamy fine sand	SM	A-1, A-2	0	80-100	75-100	40-60	15-35	---	NP
	7-51	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	80-100	75-100	40-70	25-50	20-25	NP-5
	51-60	Loam-------------	ML	A-4	0	80-100	75-100	60-85	50-60	20-30	NP-10
138-------------- Kimberlina	0-7	Loamy fine sand	SM	A-1, A-2	0	80-100	75-100	40-60	15-35	---	NP
	7-60	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	80-100	75-100	40-70	25-50	20-25	NP-5
139-------------- Kimberlina	0-7	Gravelly sandy loam.	SM	A-1, A-2	0	70-80	60-75	30-50	15-35	20-25	NP-5
	7-60	Gravelly fine sandy loam, gravelly sandy loam.	SM	A-1, A-2	0	70-80	60-75	30-50	15-35	20-25	NP-5
140-------------- Lavic	0-10	Loamy fine sand	SM	A-1, A-2	0	85-100	85-95	45-65	10-25	---	NP
	10-20	Loamy fine sand, loamy sand.	SM	A-1, A-2	0	85-100	85-95	45-65	10-25	---	NP
	20-49	Loam, sandy loam	SM	A-4	0	90-100	85-95	50-75	35-50	15-25	NP-5
	49-60	Stratified loamy sand to sand.	SM, SP-SM	A-1, A-2	0	85-100	85-95	40-60	5-25	---	NP
141-------------- Lovelace	0-19	Loamy sand-------	SM	A-1, A-2	0-5	90-100	90-100	45-75	15-25	---	NP
	19-33	Loamy sand, loamy fine sand.	SM	A-1, A-2	0	80-90	80-90	40-70	15-25	---	NP
	33-60	Loamy sand, sand	SM, SP-SM	A-1, A-2	0	80-90	75-85	40-70	5-25	---	NP
142-------------- Lucerne	0-2	Sandy loam-------	SM	A-2, A-4	0	90-100	85-100	50-65	25-40	---	NP
	2-62	Sandy loam-------	SM	A-4	0	85-100	75-100	50-65	35-50	15-25	NP-5
	62-76	Sandy loam, sandy clay loam.	SM-SC	A-4	0-5	85-100	75-100	50-85	35-50	20-30	5-10

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
143---------------- Lucerne	0-6	Sandy loam--------	SM	A-2, A-4	0	90-100	85-100	50-65	25-40	---	NP
	6-60	Sandy loam--------	SM	A-4	0	85-100	75-100	50-65	35-50	15-25	NP-5
144---------------- Manet	0-3	Coarse sand-------	SP-SM	A-1	0-5	90-100	85-100	30-50	5-10	---	NP
	3-42	Stratified sand to loamy sand.	SP-SM, SM	A-1	0	90-100	85-100	30-50	5-25	---	NP
	42-60	Loamy fine sand, fine sandy loam.	SM	A-2, A-4	0	90-100	85-100	50-75	25-50	20-25	NP-5
145---------------- Manet	0-10	Cobbly coarse sand.	SP-SM	A-1	15-40	90-100	85-95	30-50	5-10	---	NP
	10-60	Stratified sand to loamy sand.	SP-SM, SM	A-1	0-5	90-100	85-95	30-50	5-25	---	NP
146---------------- Manet	0-6	Loamy sand--------	SM	A-1, A-2	0-5	90-100	85-100	45-70	15-30	---	NP
	6-46	Stratified sand to loamy sand.	SP-SM, SM	A-1	0	90-100	85-100	30-50	5-25	---	NP
	46-60	Stratified loam to silty clay loam.	CL, ML	A-6, A-7	0	100	100	85-100	60-85	30-45	10-15
147---------------- Manet	0-12	Fine sandy loam	SM	A-4	0-5	90-100	85-100	50-75	35-50	20-25	NP-5
	12-60	Stratified sand to loamy sand.	SP-SM, SM	A-1	0	90-100	85-100	30-50	5-25	---	NP
148---------------- Mirage	0-5	Sandy loam--------	SM	A-2	0-5	85-100	85-95	55-65	25-35	20-25	NP-5
	5-21	Sandy clay loam, gravelly sandy clay loam, clay loam.	SC, CL, GC	A-6, A-2	0	60-95	55-85	50-80	25-60	30-40	10-20
	21-39	Gravelly sandy loam, gravelly sandy clay loam.	SM-SC, SC, GM-GC, GC	A-2, A-6, A-4	0	60-80	50-70	30-55	20-45	25-35	5-15
	39-60	Gravelly loamy sand, very gravelly sand.	SM, GM, GP-GM, SP-SM	A-1	0	50-80	35-70	15-50	5-15	---	NP
149*:											
Mirage-----------	0-5	Sandy loam--------	SM	A-2	0-5	85-100	85-95	55-65	25-35	20-25	NP-5
	5-21	Sandy clay loam, gravelly sandy clay loam, clay loam.	SC, CL, GC	A-6, A-2	0	60-95	55-85	50-80	25-60	30-40	10-20
	21-39	Gravelly sandy loam, gravelly sandy clay loam.	SM-SC, SC, GM-GC, GC	A-2, A-6, A-4	0	60-80	50-70	30-55	20-45	25-35	5-15
	39-60	Gravelly loamy sand, very gravelly sand.	SM, GM, GP-GM, SP-SM	A-1	0	50-80	35-70	15-50	5-15	---	NP
Joshua-----------	0-3	Loam--------------	ML, CL-ML	A-4	5-10	85-100	85-100	60-80	50-70	20-30	NP-10
	3-20	Gravelly sandy clay loam, gravelly sandy loam.	SC, GC	A-2, A-6	0-5	60-85	50-75	40-60	20-45	25-35	10-15
	20-55	Very gravelly loamy coarse sand, very gravelly coarse sandy loam.	GP-GM, GM	A-1	5-10	35-60	25-50	15-40	5-25	---	NP
150---------------- Mohave Variant	0-7	Loamy sand--------	SM	A-1, A-2	0-5	90-100	90-100	45-75	15-30	---	NP
	7-26	Sandy clay loam	SC	A-6	0	90-100	90-100	70-90	35-50	25-40	10-20
	26-60	Loamy sand--------	SM	A-1, A-2	0	75-100	75-95	35-70	10-25	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
151*:											
Nebona----------	0-2	Sandy loam-------	SM	A-2, A-4	0-5	85-100	85-95	40-60	30-50	20-30	NP-5
	2-8	Sandy loam, fine sandy loam.	SM	A-2, A-4	0-5	80-100	75-90	40-70	30-50	20-30	NP-5
	8-12	Indurated--------	---	---	---	---	---	---	---	---	---
	12-65	Stratified gravelly sand to loam.	SM	A-1, A-2	0	60-90	50-85	25-50	10-30	---	NP
Cuddeback-------	0-3	Sandy loam-------	SM	A-2	0-5	85-100	85-95	50-70	20-35	---	NP
	3-6	Sandy loam-------	SM	A-2	0	85-100	85-95	55-65	25-35	20-25	NP-5
	6-17	Gravelly sandy clay loam, sandy clay loam.	SC, GC	A-6, A-2	0-5	65-90	60-85	55-75	25-40	25-35	10-20
	17-34	Gravelly sandy loam, loamy sand.	SM	A-1, A-2	0	70-95	70-85	40-70	15-35	---	NP
	34	Indurated--------	---	---	---	---	---	---	---	---	---
152*:											
Norob-----------	0-5	Loamy sand-------	SP-SM, SM	A-2, A-3	0	100	95-100	50-75	5-15	---	NP
	5-33	Sandy clay loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	80-100	40-75	30-45	10-20
	33-60	Stratified gravelly loamy sand to sandy clay loam.	SM-SC	A-1, A-2, A-4	0	60-100	55-95	35-65	20-40	20-30	5-10
Halloran--------	0-2	Sand-------------	SP-SM, SP	A-1, A-2, A-3	0	95-100	90-100	45-70	0-10	---	NP
	2-21	Sandy loam-------	SM-SC	A-2	0	95-100	90-100	55-65	25-35	15-25	5-10
	21-33	Loamy sand-------	SM	A-1, A-2	0	95-100	90-100	45-70	15-25	---	NP
	33-60	Stratified sand to sandy loam.	SM	A-1, A-2	0	95-100	90-100	45-70	10-25	---	NP
153-------------- Peterman	0-16	Loam-------------	CL	A-6	0-5	90-100	90-100	75-85	55-75	25-35	10-15
	16-60	Clay, gravelly clay.	CL, CH	A-7	0	70-95	55-90	55-85	50-80	40-60	20-30
154-------------- Peterman	0-5	Clay-------------	CL, CH	A-7	0	80-95	80-85	75-85	70-80	40-60	20-30
	5-60	Clay, gravelly clay.	CL, CH	A-7	0	70-95	55-90	55-85	50-80	40-60	20-30
155*. Pits											
156*. Playas											
157*. Riverwash											
158*: Rock outcrop.											
Lithic Torriorthents.											
159-------------- Rosamond	0-5	Loam-------------	ML	A-4	0	100	100	85-95	50-75	25-35	NP-10
	5-44	Stratified loam to silty clay loam.	CL	A-6	0	100	95-100	85-100	60-85	25-40	10-20
	44-60	Stratified loamy coarse sand to loamy fine sand.	SM	A-2	0	95-100	95-100	50-75	15-30	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
160---------------- Rosamond	0-8	Loam---------------	ML	A-4	0	100	100	85-95	50-75	25-35	NP-10
	8-60	Stratified loam to silty clay loam.	CL	A-6	0	100	95-100	85-100	60-85	25-40	10-20
161---------------- Soboba	0-4	Gravelly sand-----	SM, SP-SM, SP	A-1	0-10	55-80	50-75	25-50	0-15	---	NP
	4-60	Stratified very gravelly loamy sand to very cobbly sand.	GP, SP	A-1	20-35	40-60	25-50	15-25	0-5	---	NP
162*: Sparkhule---------	0-2	Gravelly sandy loam.	SM	A-2	0-5	75-85	60-75	40-55	25-35	20-25	NP-5
	2-18	Gravelly sandy clay loam, gravelly clay loam, sandy clay loam.	SC	A-2, A-6	0-5	75-90	55-85	50-75	30-50	30-40	10-20
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
163*: Torriorthents.											
Torripsamments.											
Urban land.											
164---------------- Trigger	0-12	Gravelly loam-----	GM, SM	A-2, A-4	0-5	55-80	50-75	45-65	30-50	25-35	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
165*: Trigger-----------	0-12	Gravelly sandy loam.	GM, SM	A-1, A-2	0-5	55-80	50-75	35-50	20-35	25-30	NP-5
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sparkhule---------	0-2	Gravelly sandy loam.	SM	A-2	0-5	75-85	60-75	40-55	25-35	20-25	NP-5
	2-18	Gravelly sandy clay loam, gravelly clay loam, sandy clay loam.	SC	A-2, A-6	0-5	75-90	55-85	50-75	30-50	30-40	10-20
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
166*: Trigger-----------	0-12	Gravelly sandy loam.	GM, SM	A-1, A-2	0-5	55-80	50-75	35-50	20-35	25-30	NP-5
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
167---------------- Tujunga	0-14	Sand--------------	SW-SM, SM, SP-SM	A-1, A-2, A-3	0-5	90-100	75-95	40-70	5-25	---	NP
	14-60	Stratified gravelly sand to gravelly loamy sand.	SP, SW-SM, SM, SP-SM	A-1	0-5	60-80	50-75	20-50	0-20	---	NP
168*: Typic Haplargids.											
Yermo------------	0-10	Gravelly sandy loam.	SM	A-1, A-2	5-10	65-85	60-75	35-55	20-35	20-25	NP-5
	10-60	Very gravelly sandy loam.	GP-GM, GM	A-1	0-25	30-50	25-45	15-30	5-20	20-30	NP-5
169---------------- Victorville	0-16	Sandy loam--------	SM	A-2, A-4	0	90-100	75-95	50-65	25-50	20-25	NP-5
	16-35	Stratified sandy loam to fine sandy loam.	SM	A-2, A-4	0	85-95	75-95	50-65	25-50	20-25	NP-5
	35-49	Stratified sand to sandy loam.	SM, SP-SM	A-1, A-2, A-3	0	85-95	75-95	35-65	5-25	---	NP
	49-60	Clay loam, loam	CL	A-6	0	90-100	90-100	80-90	65-80	25-40	10-20
170---------------- Victorville Variant	0-5	Sand--------------	SM, SP-SM	A-1, A-2, A-3	0	85-100	85-95	40-60	5-15	---	NP
	5-42	Stratified sand to sandy clay loam.	SM	A-2, A-4	0	75-100	70-95	40-70	25-40	20-25	NP-5
	42-60	Stratified sand to loamy fine sand.	SM, SP-SM	A-1, A-2, A-3	0	75-100	70-95	40-60	5-20	---	NP
171, 172---------- Villa	0-7	Loamy sand--------	SM	A-2	0	95-100	90-100	50-80	15-30	---	NP
	7-60	Stratified sand to fine sandy loam.	SP-SM, SM	A-1, A-2, A-3	0	90-100	85-100	40-70	5-25	---	NP
173, 174---------- Wasco	0-7	Sandy loam--------	SM	A-2, A-4	0	80-100	75-100	45-65	25-40	20-25	NP-5
	7-60	Sandy loam--------	SM	A-2, A-4	0	80-100	75-100	45-65	25-40	20-25	NP-5
175*: Wrightwood-------	0-3	Loamy sand--------	SM	A-1, A-2	0	85-100	75-95	40-60	15-25	---	NP
	3-46	Sandy loam--------	SM	A-2	0-5	85-100	75-95	50-65	25-35	20-25	NP-5
	46-60	Gravelly sandy loam, gravelly sandy clay loam.	SM-SC	A-2, A-4	0-5	65-80	60-75	40-70	25-45	25-30	5-10
Bull Trail-------	0-4	Sandy loam--------	SM	A-2, A-4	0-10	100	75-100	40-60	30-40	25-30	NP-5
	4-19	Sandy clay loam, loam, sandy loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0	100	75-100	55-80	35-60	25-35	5-15
	19-60	Stratified loamy sand to loam.	SM	A-2	0-5	80-100	75-95	40-60	25-35	25-30	NP-5
176---------------- Yermo	0-10	Gravelly sandy loam.	SM	A-1, A-2	5-10	65-85	60-75	35-55	20-35	20-25	NP-5
	10-25	Gravelly sandy loam.	SM	A-1, A-2	0-5	65-85	60-75	35-55	20-35	20-30	NP-5
	25-60	Very gravelly sandy loam.	GP-GM, GM	A-1	0-25	30-50	25-45	15-30	5-20	20-30	NP-5

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
177*:											
Yermo-----------	0-10	Cobbly sandy loam	SM	A-1, A-2	15-30	75-90	65-75	35-55	20-35	20-30	NP-5
	10-25	Gravelly sandy loam.	SM	A-1, A-2	0-5	65-85	60-75	35-55	20-35	20-30	NP-5
	25-60	Very gravelly sandy loam.	GP-GM, GM	A-1	0-25	30-50	25-45	15-30	5-20	20-30	NP-5
Kimberlina------	0-10	Gravelly sandy loam.	SM	A-1, A-2	0	70-80	60-75	30-50	15-35	20-25	NP-5
	10-60	Gravelly fine sandy loam, gravelly sandy loam.	SM	A-1, A-2	0	70-80	60-75	30-50	15-35	20-25	NP-5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
100-------------- Arizo	0-15	0-5	>20	0.05-0.07	7.4-8.4	<2	Low--------	0.10	5	8	<.5
	15-60	0-5	>20	0.04-0.06	7.4-8.4	<2	Low--------	0.10			
101*:											
Arrastre---------	0-6	8-14	2.0-6.0	0.08-0.11	6.1-7.3	---	Low--------	0.32	2	3	<1
	6-26	7-14	2.0-6.0	0.08-0.11	6.1-7.3	---	Low--------	0.24			
	26	---	---	---	---	---	-----------	----			
Rock outcrop.											
102*:											
Avawatz----------	0-15	5-10	2.0-6.0	0.09-0.11	6.1-7.3	---	Low--------	0.32	5	3	<1
	15-60	3-10	6.0-20	0.05-0.08	6.6-7.3	---	Low--------	0.28			
Oak Glen---------	0-22	8-18	2.0-6.0	0.11-0.13	6.1-7.3	---	Low--------	0.24	5	3	1-4
	22-60	8-18	2.0-6.0	0.11-0.13	6.1-7.3	---	Low--------	0.28			
103*. Badland											
104-------------- Bousic	0-5	40-55	0.06-0.2	0.08-0.11	7.9-9.0	8-16	High-------	0.37	5	4	<1
	5-42	45-55	0.06-0.2	0.03-0.08	7.9-9.0	>16	High-------	0.37			
	42-60	45-70	0.06-0.2	0.03-0.08	7.9-9.0	>8	High-------	0.37			
105-------------- Bryman	0-9	4-8	2.0-6.0	0.06-0.12	7.4-8.4	<2	Low--------	0.28	5	2	<.5
	9-12	7-12	2.0-6.0	0.10-0.13	7.4-8.4	<2	Low--------	0.32			
	12-32	22-30	0.2-0.6	0.13-0.18	7.4-8.4	<2	Moderate	0.32			
	32-46	5-10	2.0-6.0	0.10-0.13	7.4-8.4	<2	Low--------	0.22			
	46-99	4-8	6.0-20	0.05-0.07	7.4-8.4	<2	Low--------	0.24			
106-------------- Bryman	0-9	4-8	2.0-6.0	0.06-0.12	7.4-8.4	<2	Low--------	0.28	5	2	<.5
	9-43	22-30	0.2-0.6	0.13-0.18	7.4-8.4	<2	Moderate	0.32			
	43-60	5-10	2.0-6.0	0.10-0.13	7.4-8.4	<2	Low--------	0.32			
107, 108--------- Bryman	0-9	4-8	2.0-6.0	0.06-0.12	7.4-8.4	<2	Low--------	0.28	5	2	<.5
	9-39	22-30	0.2-0.6	0.13-0.18	7.4-8.4	<2	Moderate	0.32			
	39-60	4-8	6.0-20	0.05-0.07	7.4-8.4	<2	Low--------	0.24			
109-------------- Bryman	0-6	20-23	0.2-0.6	0.32-0.18	7.4-8.4	<2	Moderate	0.32	5	5	<.5
	6-44	25-35	0.2-0.6	0.17-0.19	7.4-8.4	<2	Moderate	0.32			
	44-60	4-8	6.0-20	0.05-0.07	7.4-8.4	<2	Low--------	0.24			
110*:											
Bryman-----------	0-6	3-6	6.0-20	0.05-0.06	7.4-8.4	<2	Low--------	0.15	5	7	<.5
	6-31	20-25	0.2-0.6	0.12-0.13	7.4-8.4	<2	Moderate	0.20			
	31-51	6-10	2.0-6.0	0.07-0.09	7.4-8.4	<2	Low--------	0.20			
	51-60	3-6	6.0-20	0.02-0.04	7.4-8.4	<2	Low--------	0.15			
Cajon------------	0-6	0-5	6.0-20	0.04-0.06	7.4-8.4	<2	Low--------	0.10	5	5	<1
	6-60	0-5	6.0-20	0.04-0.06	7.4-8.4	<2	Low--------	0.10			
111*:											
Bull Trail-------	0-4	8-15	2.0-6.0	0.10-0.13	6.1-7.3	---	Low--------	0.28	5	3	1-3
	4-19	18-27	0.2-0.6	0.14-0.16	6.6-7.3	<2	Moderate	0.32			
	19-60	8-20	0.2-0.6	0.10-0.13	6.6-7.3	---	Low--------	0.28			
Typic Xerorthents.											
112-------------- Cajon	0-7	0-5	6.0-20	0.06-0.08	7.4-8.4	<2	Low--------	0.15	5	1	<1
	7-25	0-5	6.0-20	0.06-0.08	7.4-8.4	<2	Low--------	0.15			
	25-45	0-5	6.0-20	0.04-0.08	7.4-8.4	<2	Low--------	0.10			
	45-60	0-5	6.0-20	0.06-0.10	7.4-8.4	<2	Low--------	0.15			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
113-------------- Cajon	0-6	0-5	6.0-20	0.06-0.08	7.4-8.4	<2	Low--------	0.15	5	1	<1
	6-25	0-5	6.0-20	0.06-0.08	7.4-8.4	<2	Low--------	0.15			
	25-60	0-5	6.0-20	0.04-0.08	7.4-8.4	<2	Low--------	0.10			
114-------------- Cajon	0-6	0-5	6.0-20	0.06-0.08	7.4-8.4	<2	Low--------	0.15	5	1	<1
	6-42	0-5	6.0-20	0.06-0.08	7.4-8.4	<2	Low--------	0.15			
	42-60	0-5	6.0-20	0.04-0.08	7.4-8.4	<2	Low--------	0.10			
115-------------- Cajon	0-8	0-5	6.0-20	0.04-0.06	7.4-8.4	<2	Low--------	0.10	5	5	<1
	8-60	0-5	6.0-20	0.04-0.06	7.4-8.4	<2	Low--------	0.10			
116-------------- Cajon	0-6	0-8	6.0-20	0.06-0.10	7.4-8.4	<2	Low--------	0.15	5	2	<1
	6-30	0-8	6.0-20	0.06-0.10	7.4-8.4	<2	Low--------	0.15			
	30-60	0-5	6.0-20	0.04-0.08	7.4-8.4	<2	Low--------	0.10			
117-------------- Cajon	0-7	0-8	6.0-20	0.05-0.08	7.4-8.4	<2	Low--------	0.15	5	2	<1
	7-20	0-5	6.0-20	0.05-0.08	7.4-8.4	2-4	Low--------	0.15			
	20-42	0-8	6.0-20	0.05-0.08	7.4-8.4	2-4	Low--------	0.15			
	42-60	5-15	0.6-2.0	0.09-0.12	7.4-8.4	2-8	Low--------	0.24			
118*:											
Cajon-----------	0-6	0-5	6.0-20	0.04-0.06	7.4-8.4	<2	Low--------	0.10	5	5	<1
	6-60	0-5	6.0-20	0.04-0.06	7.4-8.4	<2	Low--------	0.10			
Arizo-----------	0-6	0-5	>20	0.05-0.07	7.4-9.0	<2	Low--------	0.10	5	3	<.5
	6-60	0-5	>20	0.04-0.06	7.4-9.0	<2	Low--------	0.10			
119*:											
Cajon-----------	0-8	0-5	6.0-20	0.06-0.08	7.4-8.4	<2	Low--------	0.15	5	1	<1
	8-60	0-5	6.0-20	0.06-0.08	7.4-8.4	<2	Low--------	0.15			
Wasco-----------	0-7	8-18	2.0-6.0	0.08-0.11	6.1-7.3	---	Low--------	0.32	5	3	<.5
	7-60	8-18	2.0-6.0	0.08-0.11	6.6-8.4	<2	Low--------	0.32			
120-------------- Cave	0-14	10-15	0.6-2.0	0.14-0.16	7.9-8.4	2-4	Low--------	0.32	1	4L	<.5
	14-21	---	---	---	---	---	----------	----			
	21-66	2-15	0.6-2.0	0.08-0.14	7.9-8.4	<4	Low--------	0.15			
121*:											
Crafton---------	0-10	8-18	2.0-6.0	0.09-0.12	6.1-6.5	---	Low--------	0.28	2	3	1-2
	10-35	8-18	2.0-6.0	0.09-0.12	6.1-6.5	---	Low--------	0.28			
	35	---	---	---	---	---	----------	----			
Sheephead-------	0-18	5-15	2.0-6.0	0.07-0.10	6.1-7.3	---	Low--------	0.17	1	8	1-3
	18	---	---	---	---	---	----------	----			
Rock outcrop.											
122*:											
Cushenbury------	0-14	4-8	2.0-6.0	0.06-0.10	6.1-7.3	---	Low--------	0.20	2	2	1-2
	14-27	4-10	2.0-6.0	0.08-0.12	6.1-7.3	---	Low--------	0.32			
	27-39	4-10	2.0-6.0	0.06-0.10	6.1-7.3	---	Low--------	0.20			
	39	---	---	---	---	---	----------	----			
Crafton---------	0-10	8-18	2.0-6.0	0.09-0.12	5.6-6.5	---	Low--------	0.28	2	3	1-2
	10-35	8-18	2.0-6.0	0.09-0.12	5.6-6.5	---	Low--------	0.28			
	35	---	---	---	---	---	----------	----			
Rock outcrop.											
123*. Dune land											
124*. Fluvents											

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
125: Glendale Variant	0-11	18-25	0.6-2.0	0.13-0.15	7.9-9.0	>8	Low	0.55	5	4L	<.5
	11-40	27-35	0.2-0.6	0.14-0.16	7.9-9.0	>8	Moderate	0.49			
	40-60	18-30	0.2-0.6	0.13-0.15	7.9-9.0	>4	Low	0.55			
126*:											
Gullied land.											
Haploxeralfs.											
127: Halloran	0-2	0-5	6.0-20	0.04-0.07	7.4-8.4	2-4	Low	0.15	5	1	<.5
	2-21	10-18	0.2-0.6	0.05-0.08	>8.4	>4	Low	0.32			
	21-33	4-8	2.0-6.0	0.02-0.06	>7.8	4-16	Low	0.24			
	33-60	5-15	2.0-6.0	0.02-0.06	>7.8	4-16	Low	0.24			
128*:											
Halloran	0-2	0-5	6.0-20	0.04-0.07	7.4-8.4	2-4	Low	0.15	5	1	<.5
	2-21	10-18	0.2-0.6	0.05-0.08	>8.4	>8	Low	0.32			
	21-33	4-8	2.0-6.0	0.02-0.06	>7.8	4-16	Low	0.24			
	33-60	5-15	2.0-6.0	0.02-0.06	>7.8	4-16	Low	0.24			
Dune land.											
129: Hanford	0-12	7-18	2.0-6.0	0.10-0.15	6.1-7.3	---	Low	0.32	5	3	.5-1
	12-60	7-18	2.0-6.0	0.10-0.15	6.6-7.8	---	Low	0.32			
130*:											
Haplargids.											
Calciorthids.											
131, 132: Helendale	0-4	4-8	6.0-20	0.06-0.09	7.4-8.4	<2	Low	0.28	5	2	<1
	4-30	8-18	2.0-6.0	0.09-0.13	7.4-8.4	<2	Low	0.32			
	30-66	4-12	2.0-6.0	0.07-0.11	7.4-8.4	<2	Low	0.32			
	66-106	4-8	6.0-20	0.06-0.09	7.4-8.4	<2	Low	0.28			
133*:											
Helendale	0-6	4-8	6.0-20	0.06-0.09	7.4-8.4	<2	Low	0.28	5	2	<1
	6-30	8-18	2.0-6.0	0.09-0.13	7.4-8.4	<2	Low	0.32			
	30-66	4-12	2.0-6.0	0.07-0.11	7.4-8.4	<2	Low	0.32			
	66-106	4-8	6.0-20	0.06-0.09	7.4-8.4	<2	Low	0.28			
Bryman	0-8	4-8	2.0-6.0	0.06-0.12	7.4-8.4	<2	Low	0.28	5	2	<.5
	8-12	7-12	2.0-6.0	0.10-0.13	7.4-8.4	<2	Low	0.32			
	12-44	22-30	0.2-0.6	0.13-0.18	7.4-8.4	<2	Moderate	0.32			
	44-60	4-8	6.0-20	0.05-0.07	7.4-8.4	<2	Low	0.24			
134: Hesperia	0-6	5-10	6.0-20	0.08-0.10	7.4-8.4	---	Low	0.24	5	2	<.5
	6-60	8-18	2.0-6.0	0.08-0.11	7.4-8.4	<2	Low	0.28			
135: Joshua	0-3	10-20	0.6-2.0	0.12-0.16	7.4-8.4	<2	Low	0.43	5	7	<.5
	3-20	18-30	0.2-0.6	0.06-0.13	7.4-8.4	4-16	Moderate	0.20			
	20-55	5-10	0.06-0.2	0.01-0.05	7.4-8.4	4-16	Low	0.17			
136: Joshua	0-5	10-20	0.6-2.0	0.12-0.16	7.4-8.4	<2	Low	0.43	5	7	<.5
	5-19	18-30	0.2-0.6	0.06-0.13	7.4-8.4	4-16	Moderate	0.20			
	19-50	5-10	0.06-0.2	0.01-0.05	7.4-8.4	4-16	Low	0.17			
137: Kimberlina	0-7	5-10	2.0-6.0	0.07-0.10	7.9-8.4	<2	Low	0.28	5	2	<1
	7-51	6-18	2.0-6.0	0.10-0.13	7.9-8.4	<4	Low	0.32			
	51-60	10-25	0.6-2.0	0.13-0.17	7.9-8.4	<4	Moderate	0.32			
138: Kimberlina	0-7	5-10	2.0-6.0	0.07-0.10	7.9-8.4	<2	Low	0.28	5	2	<1
	7-60	6-18	2.0-6.0	0.10-0.13	7.9-8.4	<4	Low	0.32			
139: Kimberlina	0-7	6-18	2.0-6.0	0.08-0.12	7.9-8.4	<2	Low	0.20	5	7	<1
	7-60	6-18	2.0-6.0	0.09-0.12	7.9-8.4	<4	Low	0.20			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
140----------------	0-10	4-8	2.0-6.0	0.06-0.10	7.4-8.4	2-4	Low--------	0.24	5	2	<1
Lavic	10-20	4-8	2.0-6.0	0.06-0.10	7.9-8.4	2-4	Low--------	0.24			
	20-49	8-18	0.6-2.0	0.08-0.14	7.9-8.4	4-8	Low--------	0.32			
	49-60	0-7	6.0-20	0.06-0.08	7.9-8.4	<2	Low--------	0.24			
141----------------	0-19	4-8	6.0-20	0.05-0.07	7.4-8.4	2-4	Low--------	0.24	5	2	<1
Lovelace	19-33	5-10	0.6-2.0	0.05-0.09	7.4-8.4	2-4	Low--------	0.24			
	33-60	4-8	2.0-6.0	0.05-0.07	7.4-8.4	2-4	Low--------	0.24			
142----------------	0-2	5-12	2.0-6.0	0.09-0.11	6.1-7.3	---	Low--------	0.32	5	3	<1
Lucerne	2-62	8-18	2.0-6.0	0.09-0.11	6.6-7.8	---	Low--------	0.32			
	62-76	15-25	0.6-2.0	0.10-0.15	6.6-7.8	---	Low--------	0.32			
143----------------	0-6	5-12	2.0-6.0	0.09-0.11	6.1-7.3	---	Low--------	0.32	5	3	<1
Lucerne	6-60	8-18	2.0-6.0	0.09-0.11	6.6-7.8	---	Low--------	0.32			
144----------------	0-3	0-5	6.0-20	0.05-0.08	7.9-8.4	2-4	Low--------	0.20	5	1	<.5
Manet	3-42	3-8	2.0-6.0	0.05-0.08	7.9-8.4	4-8	Low--------	0.20			
	42-60	5-12	2.0-6.0	0.07-0.13	7.9-8.4	4-8	Low--------	0.37			
145----------------	0-10	0-5	6.0-20	0.03-0.07	7.9-8.4	2-4	Low--------	0.20	5	5	<.5
Manet	10-60	3-8	2.0-6.0	0.05-0.08	7.9-8.4	4-8	Low--------	0.20			
146----------------	0-6	4-8	6.0-20	0.06-0.09	7.9-8.4	2-4	Low--------	0.24	5	2	<.5
Manet	6-46	3-8	2.0-6.0	0.05-0.08	7.9-8.4	4-8	Low--------	0.20			
	46-60	20-35	0.2-0.6	0.14-0.18	7.9-8.4	4-8	Moderate	0.43			
147----------------	0-12	5-12	2.0-6.0	0.10-0.13	7.9-8.4	2-4	Low--------	0.37	5	3	<.5
Manet	12-60	3-8	2.0-6.0	0.05-0.08	7.9-8.4	4-8	Low--------	0.20			
148----------------	0-5	5-18	2.0-6.0	0.08-0.10	7.4-8.4	<2	Low--------	0.32	5	5	<.5
Mirage	5-21	20-30	0.2-0.6	0.03-0.05	7.4-8.4	>16	Moderate	0.32			
	21-39	15-25	0.2-0.6	0.03-0.05	7.4-8.4	>16	Moderate	0.20			
	39-60	0-5	6.0-20	0.03-0.05	7.4-8.4	4-8	Low--------	0.10			
149*:											
Mirage-----------	0-5	5-18	2.0-6.0	0.08-0.10	7.4-8.4	<2	Low--------	0.32	5	5	<.5
	5-21	20-30	0.2-0.6	0.03-0.05	7.4-8.4	>16	Moderate	0.32			
	21-39	15-25	0.2-0.6	0.03-0.05	7.4-8.4	>16	Moderate	0.20			
	39-60	0-5	6.0-20	0.03-0.05	7.4-8.4	4-8	Low--------	0.10			
Joshua-----------	0-3	10-20	0.6-2.0	0.12-0.16	7.4-8.4	<2	Low--------	0.43	5	7	<.5
	3-20	18-30	0.2-0.6	0.06-0.13	7.4-8.4	4-16	Moderate	0.20			
	20-55	5-10	0.06-0.2	0.01-0.05	7.4-8.4	4-16	Low--------	0.17			
150----------------	0-7	5-10	6.0-20	0.06-0.08	7.4-8.4	<2	Low--------	0.24	5	2	<.5
Mohave Variant	7-26	20-35	0.2-0.6	0.15-0.18	7.4-8.4	<2	Moderate	0.32			
	26-60	5-10	6.0-20	0.06-0.08	7.9-9.0	<2	Low--------	0.24			
151*:											
Nebona-----------	0-2	7-18	0.6-2.0	0.09-0.11	7.4-8.4	<2	Low--------	0.24	1	5	<.5
	2-8	7-18	2.0-6.0	0.05-0.10	7.4-8.4	4-16	Low--------	0.32			
	8-12	---	---	---	---	---	Low--------	----			
	12-65	2-10	2.0-6.0	0.04-0.09	7.9-9.0	4-16	Low--------	0.20			
Cuddeback--------	0-3	5-10	2.0-6.0	0.08-0.10	7.4-8.4	<2	Low--------	0.24	2	5	<.5
	3-6	10-15	2.0-6.0	0.08-0.10	7.4-8.4	4-8	Low--------	0.32			
	6-17	18-25	0.2-0.6	0.12-0.16	7.4-8.4	4-8	Moderate	0.20			
	17-34	5-10	2.0-6.0	0.04-0.09	7.4-8.4	4-8	Low--------	0.24			
	34	---	---	---	---	---	-----------	----			
152*:											
Norob------------	0-5	2-7	6.0-20	0.06-0.08	6.6-8.4	<2	Low--------	0.24	1	2	<.5
	5-33	20-35	0.06-0.2	0.11-0.17	7.9-9.0	4-16	Moderate	0.32			
	33-60	10-20	0.2-0.6	0.06-0.18	7.4-8.4	<4	Low--------	0.17			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
152*:											
Halloran----------	0-2	0-5	6.0-20	0.04-0.07	7.4-8.4	2-4	Low--------	0.15	5	1	<.5
	2-21	10-18	0.2-0.6	0.05-0.08	>8.4	>4	Low--------	0.32			
	21-33	4-8	2.0-6.0	0.02-0.06	>7.8	4-16	Low--------	0.24			
	33-60	5-15	2.0-6.0	0.02-0.06	>7.8	4-16	Low--------	0.24			
153--------------- Peterman	0-16	15-25	0.6-2.0	0.12-0.15	7.9-9.0	4-8	Moderate	0.32	5	4L	.5-1
	16-60	45-55	0.06-0.2	0.03-0.05	>7.8	>16	High-------	0.24			
154--------------- Peterman	0-5	40-55	0.06-0.2	0.09-0.14	7.9-9.0	4-8	High-------	0.28	5	4	.5-1
	5-60	45-55	0.06-0.2	0.03-0.05	>7.8	>16	High-------	0.24			
155*. Pits											
156*. Playas											
157*. Riverwash											
158*: Rock outcrop.											
Lithic Torriorthents.											
159--------------- Rosamond	0-5	10-25	0.6-2.0	0.06-0.10	7.4-9.0	>4	Low--------	0.43	5	4L	<.5
	5-44	18-35	0.2-0.6	0.06-0.12	7.4-9.0	>4	Moderate	0.43			
	44-60	0-10	2.0-6.0	0.03-0.05	7.4-9.0	>4	Low--------	0.20			
160--------------- Rosamond	0-8	10-25	0.6-2.0	0.06-0.10	7.9-9.0	>4	Low--------	0.43	5	4L	<.5
	8-60	18-35	0.2-0.6	0.06-0.12	7.9-9.0	>4	Moderate	0.43			
161--------------- Soboba	0-4	0-5	>20	0.03-0.05	6.1-7.8	---	Low--------	0.15	5	7	<1
	4-60	0-5	>20	0.02-0.04	6.1-7.8	---	Low--------	0.15			
162*:											
Sparkhule--------	0-2	10-15	2.0-6.0	0.08-0.10	6.6-7.8	<2	Low--------	0.20	1	7	<1
	2-18	25-35	0.2-0.6	0.12-0.16	6.6-7.8	<2	Moderate	0.20			
	18	---	---	---	---	---	-----------	----			
Rock outcrop.											
163*: Torriorthents.											
Torripsamments.											
Urban land.											
164--------------- Trigger	0-12	10-18	2.0-6.0	0.10-0.13	7.9-8.4	<2	Low--------	0.24	1	7	<1
	12	---	---	---	---	---	-----------	----			
165*:											
Trigger----------	0-12	8-18	2.0-6.0	0.08-0.11	7.9-8.4	<2	Low--------	0.20	1	6	<1
	12	---	---	---	---	---	-----------	----			
Sparkhule--------	0-2	10-15	2.0-6.0	0.08-0.10	6.6-7.8	<2	Low--------	0.20	1	7	<1
	2-18	25-35	0.2-0.6	0.12-0.16	6.6-7.8	<2	Moderate	0.20			
	18	---	---	---	---	---	-----------	----			
Rock outcrop.											
166*:											
Trigger----------	0-12	8-18	2.0-6.0	0.08-0.11	7.9-8.4	<2	Low--------	0.20	1	6	<1
	12	---	---	---	---	---	-----------	----			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
166*: Rock outcrop.											
167--------------- Tujunga	0-14	0-5	6.0-20	0.05-0.08	6.1-7.3	---	Low--------	0.17	5	1	<1
	14-60	0-5	6.0-20	0.04-0.07	6.6-7.8	---	Low--------	0.15			
168*: Typic Haplargids.											
Yermo------------	0-10	8-15	2.0-6.0	0.07-0.10	7.4-9.0	<2	Low--------	0.20	5	7	<1
	10-60	8-15	2.0-6.0	0.03-0.05	7.4-9.0	<2	Low--------	0.10			
169--------------- Victorville	0-16	8-18	2.0-6.0	0.08-0.12	6.6-7.8	<4	Low--------	0.24	5	3	1-2
	16-35	8-18	2.0-6.0	0.08-0.12	6.6-8.4	<4	Low--------	0.28			
	35-49	0-10	2.0-6.0	0.06-0.08	6.6-8.4	<4	Low--------	0.24			
	49-60	20-35	0.2-0.6	0.15-0.19	6.6-8.4	<4	Moderate	0.37			
170--------------- Victorville Variant	0-5	0-5	6.0-20	0.04-0.06	7.9-9.0	8-16	Low--------	0.20	5	1	<.5
	5-42	8-12	0.6-2.0	0.04-0.09	7.9-9.0	8-16	Low--------	0.28			
	42-60	4-8	6.0-20	0.05-0.08	7.9-9.0	4-8	Low--------	0.24			
171, 172---------- Villa	0-7	2-10	6.0-20	0.07-0.10	7.4-8.4	<4	Low--------	0.24	5	2	<1
	7-60	4-10	2.0-6.0	0.06-0.10	7.4-8.4	<4	Low--------	0.24			
173, 174---------- Wasco	0-7	8-18	2.0-6.0	0.08-0.11	6.1-7.3	---	Low--------	0.32	5	3	<.5
	7-60	8-18	2.0-6.0	0.08-0.11	6.6-8.4	<2	Low--------	0.32			
175*: Wrightwood-------	0-3	5-10	2.0-6.0	0.06-0.08	6.1-7.3	---	Low--------	0.28	5	2	<1
	3-46	8-15	2.0-6.0	0.08-0.11	6.1-7.3	---	Low--------	0.32			
	46-60	15-25	0.6-2.0	0.08-0.15	6.1-7.3	---	Low--------	0.24			
Bull Trail-------	0-4	8-20	2.0-6.0	0.10-0.13	6.1-7.3	---	Low--------	0.28	5	3	1-3
	4-19	18-27	0.2-0.6	0.14-0.16	6.6-7.3	<2	Moderate	0.32			
	19-60	8-20	0.2-0.6	0.10-0.13	6.6-7.3	---	Low--------	0.28			
176--------------- Yermo	0-10	8-15	2.0-6.0	0.07-0.10	7.4-9.0	<2	Low--------	0.20	5	7	<1
	10-25	8-15	2.0-6.0	0.07-0.10	7.4-9.0	<2	Low--------	0.20			
	25-60	8-15	2.0-6.0	0.03-0.05	7.4-9.0	<2	Low--------	0.10			
177*: Yermo------------	0-10	8-15	2.0-6.0	0.07-0.10	7.4-9.0	<2	Low--------	0.20	5	8	<1
	10-25	8-15	2.0-6.0	0.07-0.10	7.9-9.0	<2	Low--------	0.20			
	25-60	8-15	2.0-6.0	0.03-0.05	7.9-9.0	<2	Low--------	0.10			
Kimberlina-------	0-10	6-18	2.0-6.0	0.08-0.12	7.9-8.4	<2	Low--------	0.20	5	7	<1
	10-60	6-18	2.0-6.0	0.09-0.12	7.9-8.4	<4	Low--------	0.20			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SOIL AND WATER FEATURES

[The definition of "flooding" in the Glossary explains terms such as "rare" and "brief." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Thickess	Depth	Thickness	Uncoated steel	Concrete
					In		In			
100---------------- Arizo	A	Occasional	Very brief	Mar-Sep	>60	---	---	---	Moderate	Low.
101*: Arrastre----------	B	None---------	---	---	20-40	Hard	---	---	Moderate	Low.
Rock outcrop.										
102*: Avawatz-----------	A	Rare---------	---	---	>60	---	---	---	Moderate	Low.
Oak Glen----------	B	Rare---------	---	---	>60	---	---	---	Moderate	Moderate.
103*. Badland										
104---------------- Bousic	D	Rare---------	---	---	>60	---	---	---	High------	High.
105, 106, 107, 108--------------- Bryman	B	None---------	---	---	>60	---	---	---	High------	Low.
109---------------- Bryman	B	Rare---------	---	---	>60	---	---	---	High------	Low.
110*: Bryman------------	B	None---------	---	---	>60	---	---	---	High------	Low.
Cajon-------------	A	None---------	---	---	>60	---	---	---	Moderate	Low.
111*: Bull Trail--------	B	None---------	---	---	>60	---	---	---	Moderate	Moderate.
Typic Xerorthents.										
112, 113, 114----- Cajon	A	None---------	---	---	>60	---	---	---	Moderate	Low.
115---------------- Cajon	A	Rare---------	---	---	>60	---	---	---	Moderate	Low.
116---------------- Cajon	A	None---------	---	---	>60	---	---	---	Moderate	Low.
117---------------- Cajon	A	None---------	---	---	>60	---	---	---	High------	Low.
118*: Cajon-------------	A	Rare---------	---	---	>60	---	---	---	Moderate	Low.
Arizo-------------	A	Occasional	Very brief	Mar-Sep	>60	---	---	---	Moderate	Low.
119*: Cajon-------------	A	None---------	---	---	>60	---	---	---	Moderate	Low.
Wasco-------------	B	None---------	---	---	>60	---	---	---	High------	Low.
120---------------- Cave	D	None---------	---	---	>60	---	14-20	Thick	High------	Low.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	Bedrock: Depth	Bedrock: Thickess	Cemented pan: Depth	Cemented pan: Thickness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					In		In			
121*:										
Crafton	C	None	---	---	20-40	Soft	---	---	Moderate	Moderate.
Sheephead	C	None	---	---	15-20	Soft	---	---	Moderate	Moderate.
Rock outcrop.										
122*:										
Cushenbury	B	None	---	---	20-40	Soft	---	---	Moderate	Moderate.
Crafton	C	None	---	---	20-40	Soft	---	---	Moderate	Moderate.
Rock outcrop.										
123*. Dune land										
124*. Fluvents										
125 Glendale Variant	B	Rare	---	---	>60	---	---	---	High	Low.
126*:										
Gullied land.										
Haploxeralfs.										
127 Halloran	C	Rare	---	---	>60	---	---	---	High	High.
128*:										
Halloran	C	Rare	---	---	>60	---	---	---	High	High.
Dune land.										
129 Hanford	B	Rare	---	---	>60	---	---	---	Moderate	Moderate.
130*:										
Haplargids.										
Calciorthids.										
131, 132 Helendale	B	None	---	---	>60	---	---	---	High	Low.
133*:										
Helendale	B	None	---	---	>60	---	---	---	High	Low.
Bryman	B	None	---	---	>60	---	---	---	High	Low.
134 Hesperia	B	None	---	---	>60	---	---	---	High	Low.
135, 136 Joshua	C	None	---	---	>60	---	---	---	High	High.
137, 138, 139 Kimberlina	B	None	---	---	>60	---	---	---	High	Low.
140 Lavic	B	None	---	---	>60	---	---	---	High	Low.
141 Lovelace	B	None	---	---	>60	---	---	---	High	High.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	Bedrock: Depth	Bedrock: Thickess	Cemented pan: Depth	Cemented pan: Thickness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					In		In			
142, 143---------- Lucerne	B	None---------	---	---	>60	---	---	---	Moderate	Low.
144--------------- Manet	B	Rare---------	---	---	>60	---	---	---	High-----	High.
145--------------- Manet	B	Occasional	Brief-----	Dec-Feb	>60	---	---	---	High-----	High.
146, 147---------- Manet	B	Rare---------	---	---	>60	---	---	---	High-----	High.
148--------------- Mirage	C	None---------	---	---	>60	---	---	---	High-----	High.
149*:										
Mirage-----------	C	None---------	---	---	>60	---	---	---	High-----	High.
Joshua-----------	C	None---------	---	---	>60	---	---	---	High-----	High.
150--------------- Mohave Variant	B	None---------	---	---	>60	---	---	---	High-----	Low.
151*:										
Nebona-----------	D	None---------	---	---	>60	---	6-14	Thick	High-----	Low.
Cuddeback--------	C	None---------	---	---	>60	---	20-40	Thick	High-----	Low.
152*:										
Norob------------	C	None---------	---	---	>60	---	---	---	High-----	Moderate.
Halloran---------	C	None---------	---	---	>60	---	---	---	High-----	High.
153--------------- Peterman	D	None---------	---	---	>60	---	---	---	High-----	High.
154--------------- Peterman	D	Rare---------	---	---	>60	---	---	---	High-----	High.
155*. Pits										
156*. Playas										
157*. Riverwash										
158*:										
Rock outcrop.										
Lithic Torriorthents.										
159, 160---------- Rosamond	C	Rare---------	---	---	>60	---	---	---	High-----	Low.
161--------------- Soboba	A	Occasional	Very brief	Nov-Mar	>60	---	---	---	Moderate	Low.
162*:										
Sparkhule--------	D	None---------	---	---	14-20	Hard	---	---	High-----	Low.
Rock outcrop.										
163*: Torriorthents.										

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Thickess	Depth	Thickness	Uncoated steel	Concrete
					In		In			
163*:										
Torripsamments.										
Urban land.										
164---------------- Trigger	D	None---------	---	---	10-18	Hard	---	---	High------	Low.
165*:										
Trigger-----------	D	None---------	---	---	10-18	Hard	---	---	High------	Low.
Sparkhule---------	D	None---------	---	---	14-20	Hard	---	---	High------	Low.
Rock outcrop.										
166*:										
Trigger-----------	D	None---------	---	---	10-18	Hard	---	---	High------	Low.
Rock outcrop.										
167---------------- Tujunga	A	Occasional	Brief------	Dec-Mar	>60	---	---	---	Moderate	Low.
168*:										
Typic Haplargids.										
Yermo-------------	B	None---------	---	---	>60	---	---	---	High------	Low.
169---------------- Victorville	B	Rare---------	---	---	>60	---	---	---	High------	Low.
170---------------- Victorville Variant	B	Rare---------	---	---	>60	---	---	---	High------	Low.
171, 172----------- Villa	B	Rare---------	---	---	>60	---	---	---	High------	Low.
173, 174----------- Wasco	B	None---------	---	---	>60	---	---	---	High------	Low.
175*:										
Wrightwood--------	B	None---------	---	---	>60	---	---	---	Moderate	Low.
Bull Trail--------	B	None---------	---	---	>60	---	---	---	Moderate	Moderate.
176---------------- Yermo	B	None---------	---	---	>60	---	---	---	High------	Low.
177*:										
Yermo-------------	B	None---------	---	---	>60	---	---	---	High------	Low.
Kimberlina--------	B	None---------	---	---	>60	---	---	---	High------	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Arizo	Sandy-skeletal, mixed, thermic Typic Torriorthents
Arrastre	Coarse-loamy, mixed, mesic Typic Xerochrepts
Avawatz	Sandy, mixed, mesic Mollic Xerofluvents
Bousic	Fine, mixed (calcareous), thermic Typic Torriorthents
Bryman	Fine-loamy, mixed, thermic Typic Haplargids
Bull Trail*	Fine-loamy, mixed, mesic Mollic Haploxeralfs
Cajon**	Mixed, thermic Typic Torripsamments
Calciorthids	Calciorthids
Cave	Loamy, mixed, thermic, shallow Typic Paleorthids
Crafton	Coarse-loamy, mixed, mesic Entic Haploxerolls
Cuddeback	Fine-loamy, mixed, thermic Typic Durargids
Cushenbury	Coarse-loamy, mixed, mesic Typic Haploxerolls
Fluvents	Fluvents
Glendale Variant	Fine-silty, mixed, (calcareous), thermic Typic Torrifluvents
Halloran	Coarse-loamy, mixed, thermic Typic Natrargids
Haplargids	Haplargids
Haploxeralfs	Haploxeralfs
Hanford	Coarse-loamy, mixed, nonacid, thermic Typic Xerorthents
Helendale	Coarse-loamy, mixed, thermic Typic Haplargids
Hesperia	Coarse-loamy, mixed, nonacid, thermic Xeric Torriorthents
Joshua	Fine-loamy, mixed, thermic Haplic Durargids
Kimberlina	Coarse-loamy, mixed (calcareous), thermic Typic Torriorthents
Lavic	Coarse-loamy, mixed, thermic Typic Calciorthids
Lithic Torriorthents	Lithic Torriorthents
Lovelace	Sandy, mixed, thermic Typic Calciorthids
Lucerne	Coarse-loamy, mixed, thermic Xeralfic Haplargids
Manet	Sandy, mixed, thermic Typic Torrifluvents
Mirage	Fine-loamy, mixed, thermic Typic Haplargids
Mohave Variant	Fine-loamy, mixed, thermic Typic Haplargids
Nebona	Loamy, mixed, thermic, shallow Typic Durorthids
Norob	Fine-loamy, mixed, thermic Typic Natrargids
Oak Glen	Coarse-loamy, mixed, mesic Pachic Haploxerolls
Peterman	Fine, mixed, thermic Typic Calciorthids
Rosamond	Fine-loamy, mixed (calcareous), thermic Typic Torrifluvents
Sheephead	Loamy, mixed, mesic, shallow Entic Ultic Haploxerolls
Soboba	Sandy-skeletal, mixed, thermic Typic Xerofluvents
Sparkhule	Loamy, mixed, thermic Lithic Haplargids
Torriorthents	Torriorthents
Torripsamments	Torripsamments
Trigger	Loamy, mixed (calcareous), thermic Lithic Torriorthents
Tujunga	Mixed, thermic Typic Xeropsamments
Typic Haplargids	Typic Haplargids
Typic Xerorthents	Typic Xerorthents
Victorville	Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents
Victorville Variant	Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents
Villa	Sandy, mixed, thermic Typic Torrifluvents
Wasco	Coarse-loamy, mixed, nonacid, thermic Typic Torriorthents
Wrightwood	Coarse-loamy, mixed, mesic Typic Haploxeralfs
Yermo	Loamy-skeletal, mixed (calcareous), thermic Typic Torriorthents

* The Bull Trail soil in this survey area is taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

** The Cajon soil in map unit 116 is taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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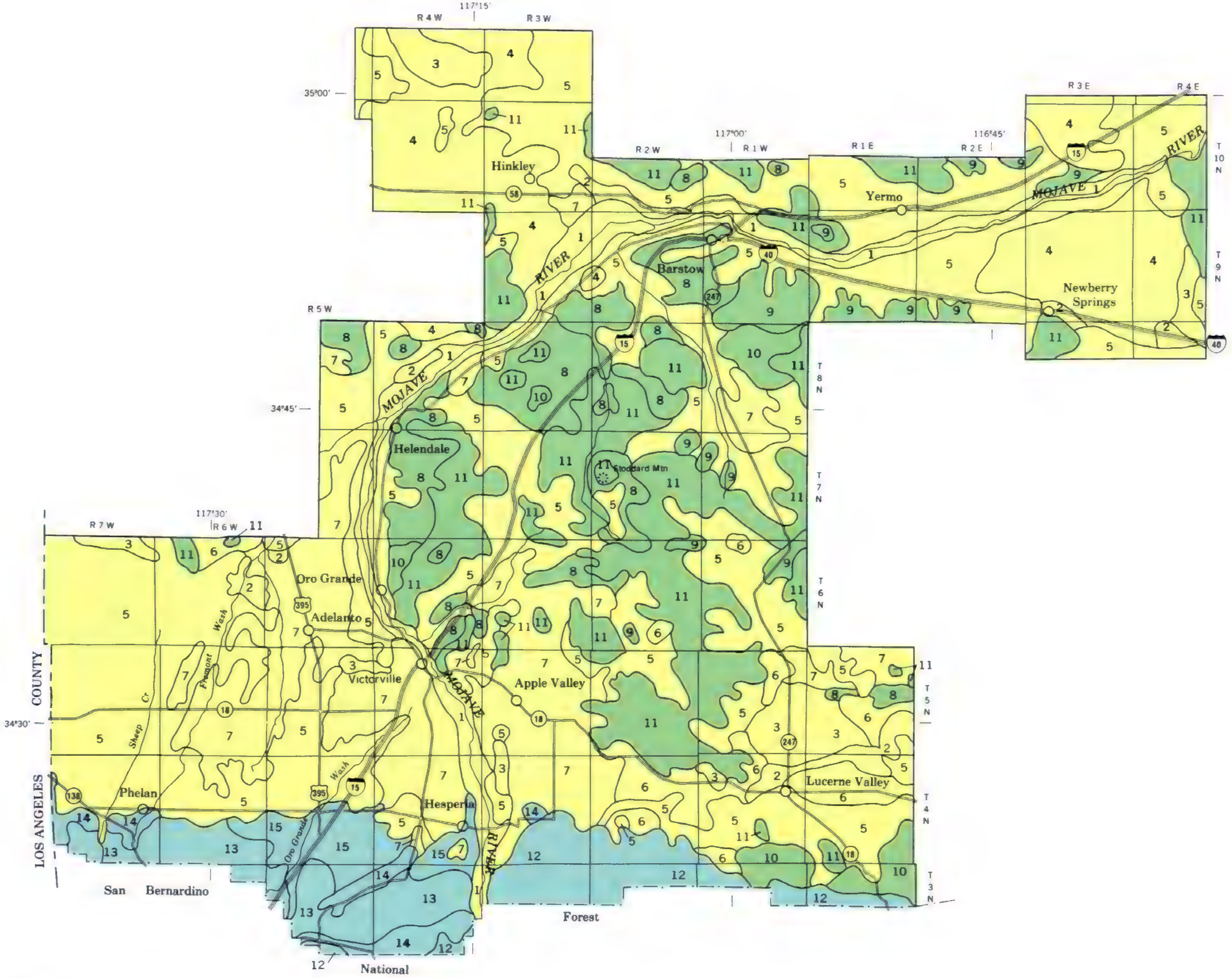

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

MAPPING UNITS

SOILS OF THE MOJAVE DESERT ON FLOOD PLAINS, BASIN RIMS, ALLUVIAL FANS, AND TERRACES

1 Villa-Riverwash-Victorville: Very deep, nearly level, moderately well drained soils, and Riverwash; on flood plains and low terraces

2 Rosamond-Lavic-Cave: Very deep and shallow, nearly level and gently sloping, well drained and moderately well drained soils; on basin rims and low alluvial fans

3 Playas-Bousic: Playas and very deep, nearly level, moderately well drained soils; on basin rims

4 Halloran-Cajon, loamy substratum-Norob: Very deep, nearly level and gently sloping, moderately well drained, somewhat excessively drained, and well drained soils; on terraces and alluvial fans

5 Cajon-Manet: Very deep, nearly level to strongly sloping, somewhat excessively drained and well drained soils; on recent alluvial fans

6 Kimberlina-Wasco: Very deep, nearly level and gently sloping, well drained, soils; on alluvial fans

7 Bryman-Helendale: Very deep, nearly level to strongly sloping, well drained soils; on alluvial fans and terraces

SOILS OF THE MOJAVE DESERT ON OLD TERRACES THAT HAVE A DESERT PAVEMENT AND ON ALLUVIAL FANS, FOOTHILLS, AND MOUNTAINS

8 Mirage-Joshua: Very deep and moderately deep, gently sloping to strongly sloping, well drained soils that have a desert pavement; on old terraces

9 Nebona-Cuddeback: Shallow and moderately deep, gently sloping and moderately sloping, well drained soils that have a desert pavement; on old terraces and alluvial fans

10 Yermo-Kimberlina-Typic Haplargids: Very deep, gently sloping to steep, well drained soils; on alluvial fans and hills

11 Rock outcrop-Lithic Torriorthents-Sparkhule: Rock outcrop and very shallow and shallow, moderately steep and steep, well drained soils; on desert foothills and mountains

SOILS OF THE SAN GABRIEL AND SAN BERNARDINO MOUNTAINS ON MOUNTAINS, FOOTHILLS, ALLUVIAL FANS, AND TERRACES

12 Arrastre-Rock outcrop-Crafton: Moderately deep, moderately steep and steep, well drained soils, and Rock outcrop; on foothills and mountainous uplands

13 Gullied land-Haploxeralfs-Bull Trail: Gullied land and very deep, gently sloping to moderately steep, well drained soils; on alluvial fan remnants, old alluvial fans, and terraces

14 Avawatz-Oak Glen: Very deep, gently sloping and moderately sloping, somewhat excessively drained and well drained soils; on alluvial fans and stream terraces

15 Hesperia-Lucerne: Very deep, nearly level and gently sloping, well drained soils; on high alluvial fans and terraces

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SOIL CONSERVATION SERVICE
REGENTS OF THE UNIVERSITY OF CALIFORNIA,
AGRICULTURAL EXPERIMENT STATION

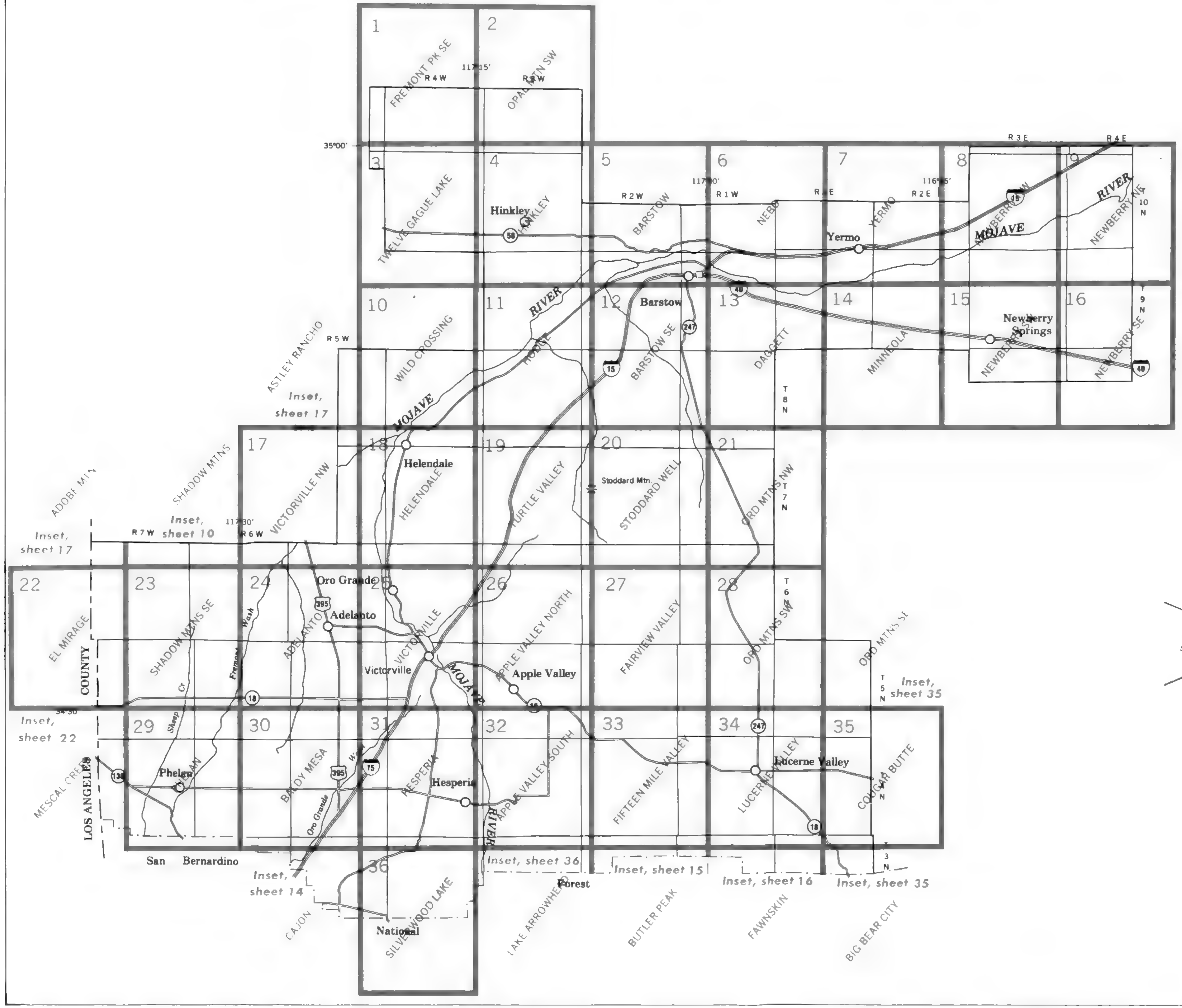
GENERAL SOIL MAP
SAN BERNARDINO COUNTY, CALIFORNIA, MOJAVE RIVER AREA

N

Scale 1:380,160

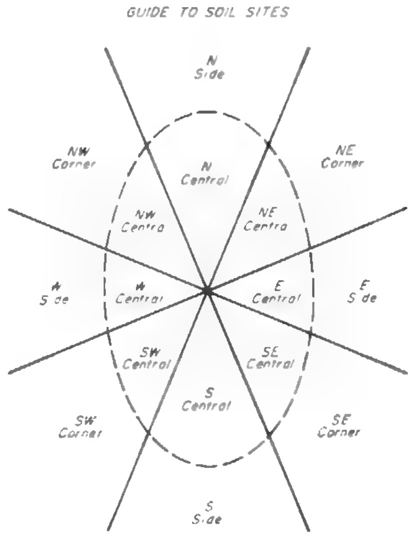
1 0 1 2 3 4 5 6 Miles

1 0 5 10 Km



SOIL SITE LOCATIONS FOR SAN BERNARDINO COUNTY, MOJAVE RIVER AREA, CALIFORNIA

NAME OF SERIES	SHEET NUMBER	PART OF SHEET
Arizo	34	S. Side
Arrastre	33	S. Side
Avawatz	29	S. Central
Bousic	34	N. Side
Bryman	24	S. Side
Bull Trail	29	SE Corner
Cajon	34	E. Side
Cave	35	NW Corner
Crafton	33	S. Side
Cuddeback	25	NE Central
Cushenbury	Inset to 15	SW Corner
Glendale Variant	34	NE Corner
Halloran	15	E. Side
Hanford	29	SW Corner
Helendale	23	SE Corner
Hesperia	30	SE Corner
Joshua	18	S. Central
Kimberlina	35	W. Central
Lavic	24	N. Side
Lovelace	35	N. Side
Lucerne	31	SE Corner
Manet	20	N. Side
Mirage	23	E. Central
Mohave Variant	Inset A to 17	NW Corner
Nebona	11	SE Corner
Norob	3	NE Corner
Oak Glen	36	N. Central
Peterman	34	N. Side
Rosamond	17	S. Side
Sheephead	33	S. Side
Soboba	29	W. Side
Sparkhule	19	E. Side
Trigger	17	S. Side
Tujunga	29	W. Side
Victorville	25	SE Central
Victorville Variant	5	W. Side
Villa	10	SE Central
Wasco	33	NW Central
Wrightwood	Inset to 14	SE Central
Yermo	34	S. Side



N

INDEX TO MAP SHEETS

SAN BERNARDINO COUNTY, CALIFORNIA, MOJAVE RIVER AREA

Scale 1:380,160

1 0 1 2 3 4 5 6 Miles

1 0 5 10 Km

LEGEND

SYMBOL	NAME
100	Arizo gravelly loamy sand, 2 to 9 percent slopes
101	Arrastre-Rock outcrop complex, 30 to 50 percent slopes*
102	Avawatz-Oak Glen association, gently sloping*
103	Badland
104	Bousic clay
105	Bryman loamy fine sand, 0 to 2 percent slopes
106	Bryman loamy fine sand, 2 to 5 percent slopes
107	Bryman loamy fine sand, 5 to 9 percent slopes
108	Bryman loamy fine sand, 9 to 15 percent slopes
109	Bryman sandy clay loam, 0 to 2 percent slopes
110	Bryman-Cajon association, rolling*
111	Bull Trail-Typic Xerorthents association, moderately steep*
112	Cajon sand, 0 to 2 percent slopes
113	Cajon sand, 2 to 9 percent slopes
114	Cajon sand, 9 to 15 percent slopes
115	Cajon gravelly sand, 2 to 15 percent slopes
116	Cajon loamy sand, 5 to 9 percent slopes
117	Cajon loamy sand, loamy substratum, 0 to 2 percent slopes
118	Cajon-Arizo complex, 2 to 15 percent slopes*
119	Cajon-Wasco, cool, complex, 2 to 9 percent slopes*
120	Cave loam, dry, 0 to 2 percent slopes
121	Crafton-Sheephead-Rock outcrop association, steep*
122	Cushenbury-Crafton-Rock outcrop complex, 15 to 50 percent slopes*
123	Dune land
124	Fluvents, occasionally flooded
125	Glendale Variant silt loam, saline-alkali
126	Gullied land-Haploxeralfs association*
127	Halloran sandy loam
128	Halloran-Dune land complex, 0 to 15 percent slopes*
129	Hanford sandy loam, cool, 2 to 9 percent slopes
130	Haplargids-Calciorthids complex, 15 to 50 percent slopes*
'31	Helendale loamy sand, 0 to 2 percent slopes
132	Helendale loamy sand, 2 to 5 percent slopes
133	Helendale-Bryman loamy sands, 2 to 5 percent slopes*
134	Hesperia loamy fine sand, 2 to 5 percent slopes
135	Joshua loam, 2 to 5 percent slopes
136	Joshua loam, 9 to 15 percent slopes
137	Kimberlina loamy fine sand, cool, 0 to 2 percent slopes
138	Kimberlina loamy fine sand, cool, 2 to 5 percent slopes
139	Kimberlina gravelly sandy loam, cool, 2 to 5 percent slopes
140	Lavic loamy fine sand
141	Lovelace loamy sand, 5 to 9 percent slopes
142	Lucerne sandy loam, 0 to 2 percent slopes
143	Lucerne sandy loam, 2 to 5 percent slopes
144	Manet coarse sand, 2 to 5 percent slopes
145	Manet cobbly coarse sand, 2 to 9 percent slopes
146	Manet loamy sand, loamy substratum, 0 to 2 percent slopes
147	Manet fine sandy loam, 0 to 2 percent slopes
148	Mirage sandy loam, 2 to 5 percent slopes*
149	Mirage-Joshua complex, 2 to 5 percent slopes*
150	Mohave Variant loamy sand, 0 to 2 percent slopes
151	Nebona-Cuddeback complex, 2 to 9 percent slopes*
152	Norob-Halloran complex, 0 to 5 percent slopes*
153	Peterman loam
154	Peterman clay
155	Pits
156	Playas
157	Riverwash
158	Rock outcrop-Lithic Torriorthents complex, 15 to 50 percent slopes*
159	Rosamond loam, saline-alkali
160	Rosamond loam, strongly saline-alkali
161	Soboba gravelly sand, cool, 2 to 9 percent slopes
162	Sparkhule-Rock outcrop complex, 15 to 50 percent slopes*
163	Torriorthents Torripsamments Urban land complex, 0 to 9 percent slopes*
164	Trigger gravelly loam, 5 to 15 percent slopes*
165	Trigger Sparkhule Rock outcrop association, steep*
166	Trigger Rock outcrop complex, 30 to 50 percent slopes*
167	Tujunga sand, cool, 2 to 9 percent slopes
168	Typic Haplargids-Yermo complex, 8 to 30 percent slopes*
169	Victorville sandy loam
170	Victorville Variant sand
171	Villa loamy sand
172	Villa loamy sand, hummocky
173	Wasco sandy loam, cool, 0 to 2 percent slopes
174	Wasco sandy loam, cool, 2 to 5 percent slopes
175	Wrightwood-Bull Trail association, sloping*
176	Yermo gravelly sandy loam, 30 to 50 percent slopes
177	Yermo-Kimberlina, cool, association, sloping*
	Water (shown by conventional symbols)

*Broadly defined mapping units

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES
- National
- State
- County, parish, municipo
- Reservation, national or state
- Small park, cemetery, airfield, airport, floodpool, etc. — Davis Airstrip; Cem; FLOOD POOL LINE
- Land grant
- Limit of soil survey (labeled)

TOWNSHIP OR RANGE LINE U S LAND SURVEY

SECTION LINE U S LAND SURVEY

TOWNSHIP LINE NOT U S LAND SURVEY

SECTION LINE NOT U S LAND SURVEY

SECTION CORNER Found Indicated

BOUNDARY MONUMENT

ROADS
- Divided hard surface
- Primary highway hard surface
- Secondary highway hard surface
- Light duty road hard or improved surface
- Unimproved road
- Trail

ROAD EMBLEMS & DESIGNATIONS
- Interstate — 70
- Federal — 410
- State — 52
- County, farm or ranch — 378

RAILROADS
- Single track
- Multiple track

LEVEES
- Without road
- With road
- With railroad

POWER TRANSMISSION LINE

LANDMARK LINE (labeled as to type) — TELEPHONE

OVERPASS UNDERPASS

DAMS
- Large dam
- Small dam masonry · earth — w; water

MISCELLANEOUS MAP FEATURES
- Buildings (dwelling, farmstead, etc.)
- School Church
- Buildings (barn, warehouse, etc.)
- Tanks oil water (labeled only if water) — Water Tank
- Wells other than water (labeled as to type) — Oil; Gas
- U S mineral or location monument Prospect
- Quarry Gravel Pit
- Mine shaft Tunnel or cave entrance
- Campsite Picnic area
- Located or landmark object Windmill
- Foreshore flat
- Horizontal control station
- Vertical control station — BM · 671 · 672
- Road fork Section corner with elevation — 429; 58
- Checked spot elevation — · 5970

WATER FEATURES

DRAINAGE
- Perennial double line
- Perennial single line
- Intermittent
- Drainage end

CANALS OR DITCHES
- Double line — CANAL
- Drainage and or irrigation

LAKES PONDS AND RESERVOIRS
- Perennial — w; water
- Intermittent — int; intermittent

MISCELLANEOUS WATER FEATURES
- Land subject to controlled inundation
- Marsh or swamp
- Aqueduct tunnel
- Spring
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 102; 108

ESCARPMENTS
- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE — S

MISCELLANEOUS
- Blowout
- Clay spot
- Gravelly spot
- Gumbo slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Saline spot
- Severely eroded spot
- Slide or slip (tips point up slope)
- Stony spot Very stony spot
- Rock outcrop
- Sand Dunes
- Borrow Pits — BP

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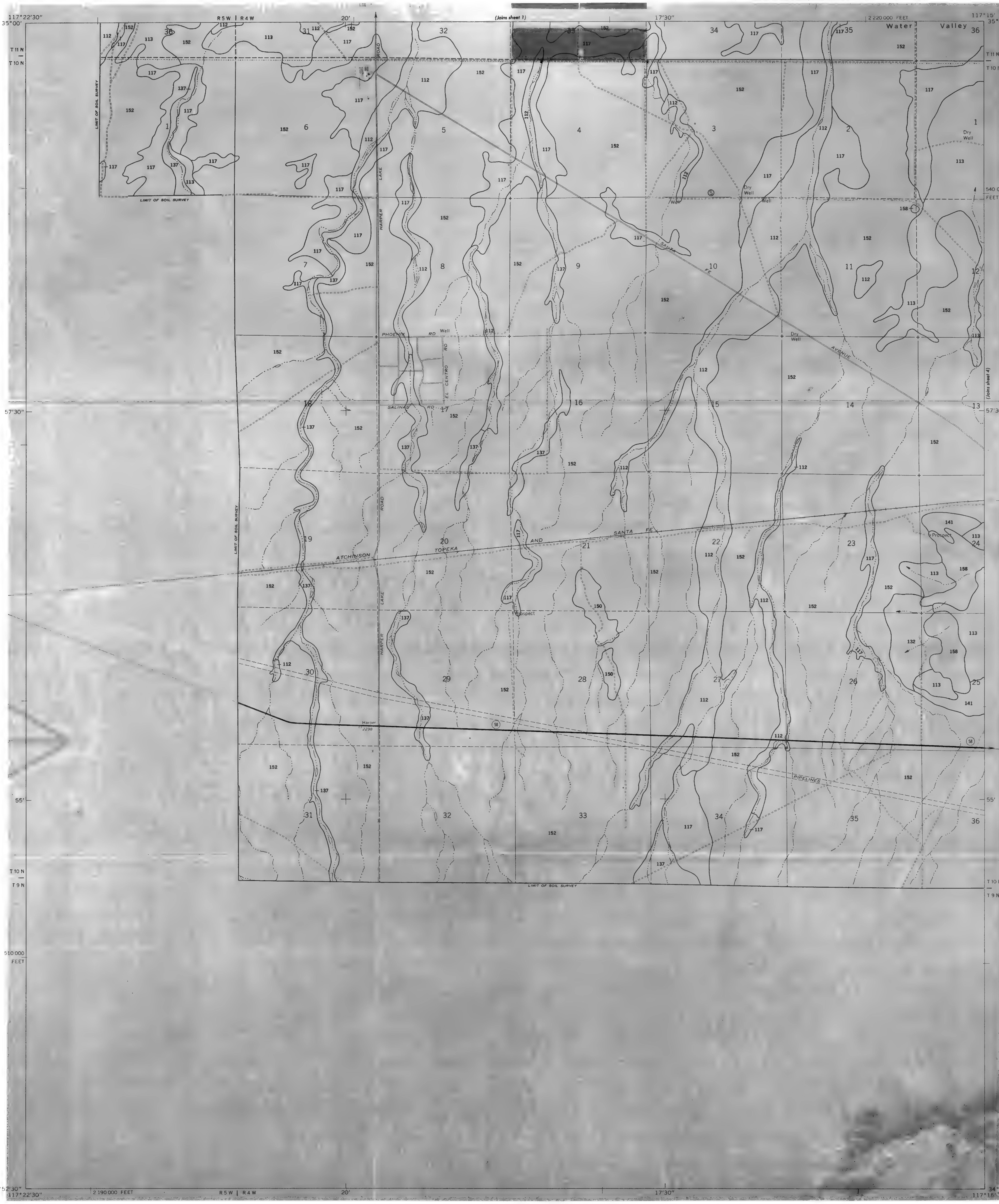
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



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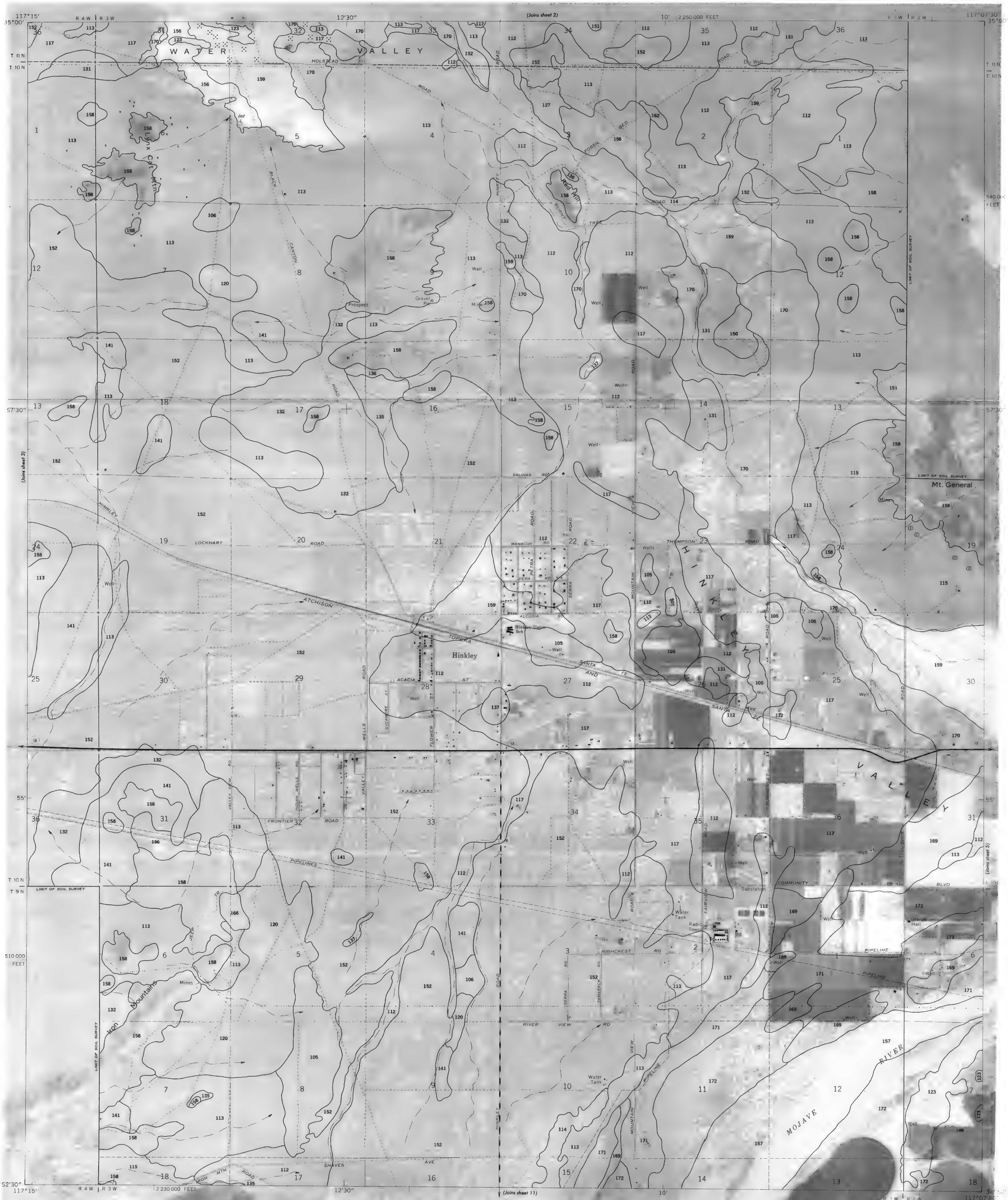

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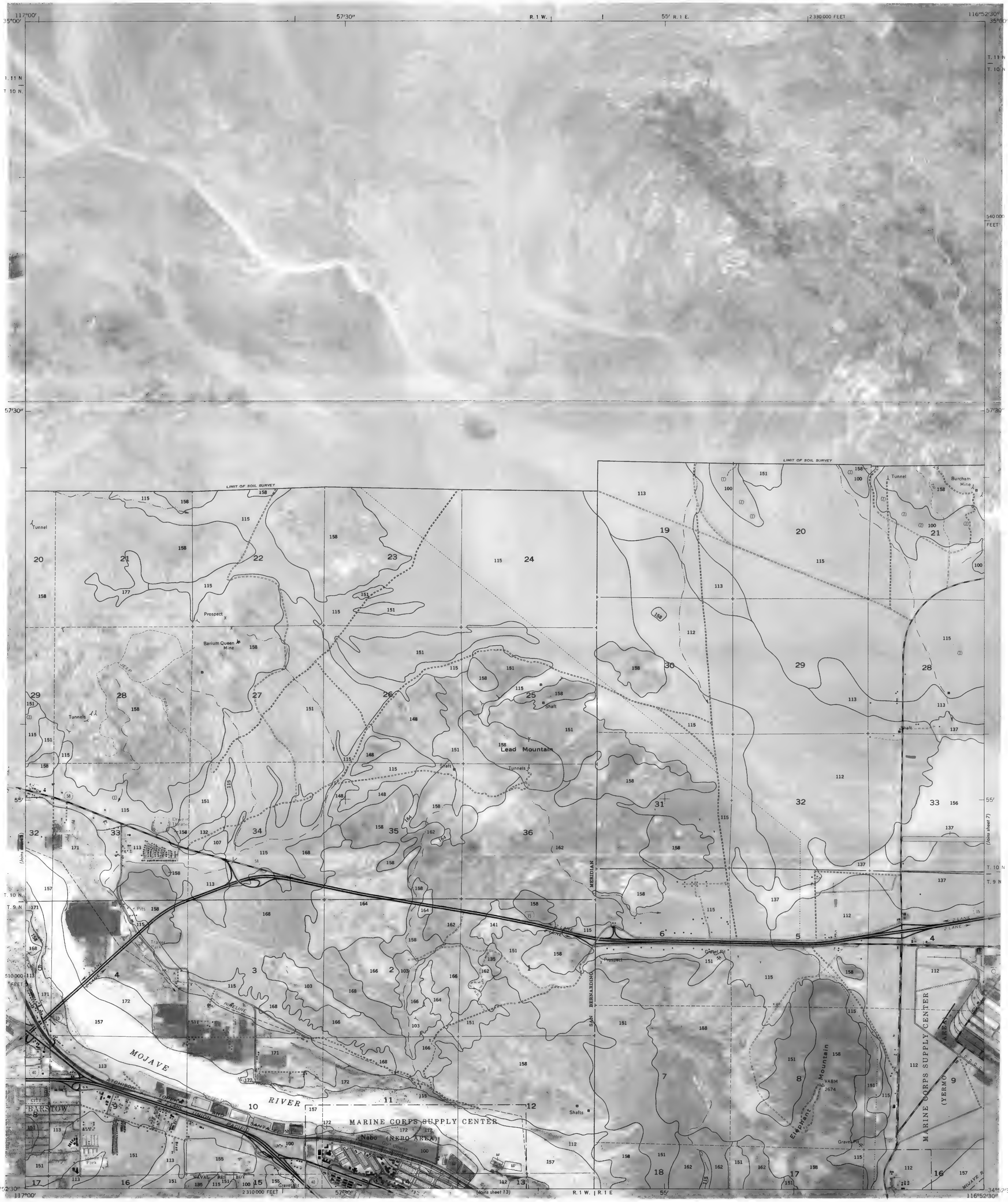

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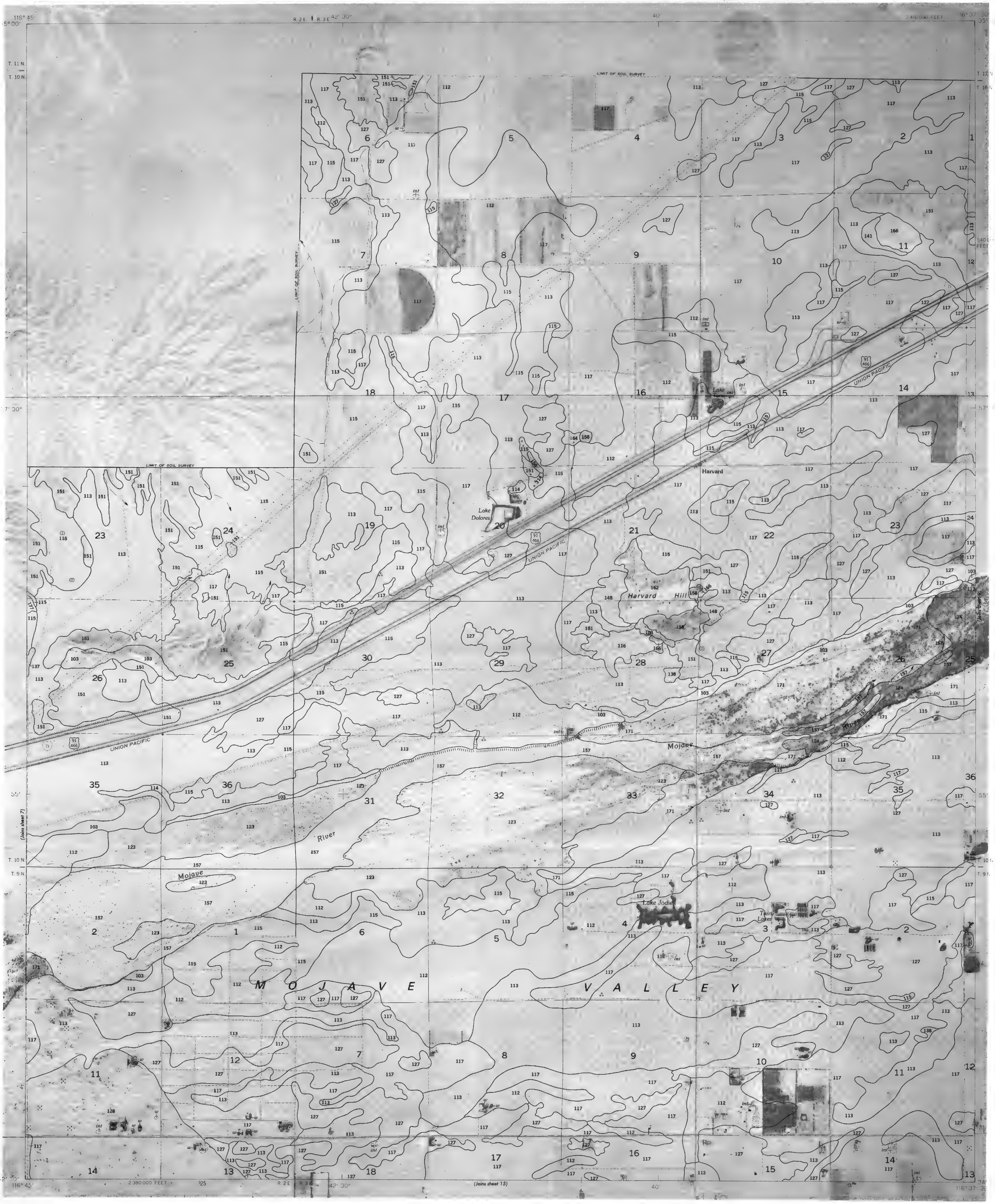

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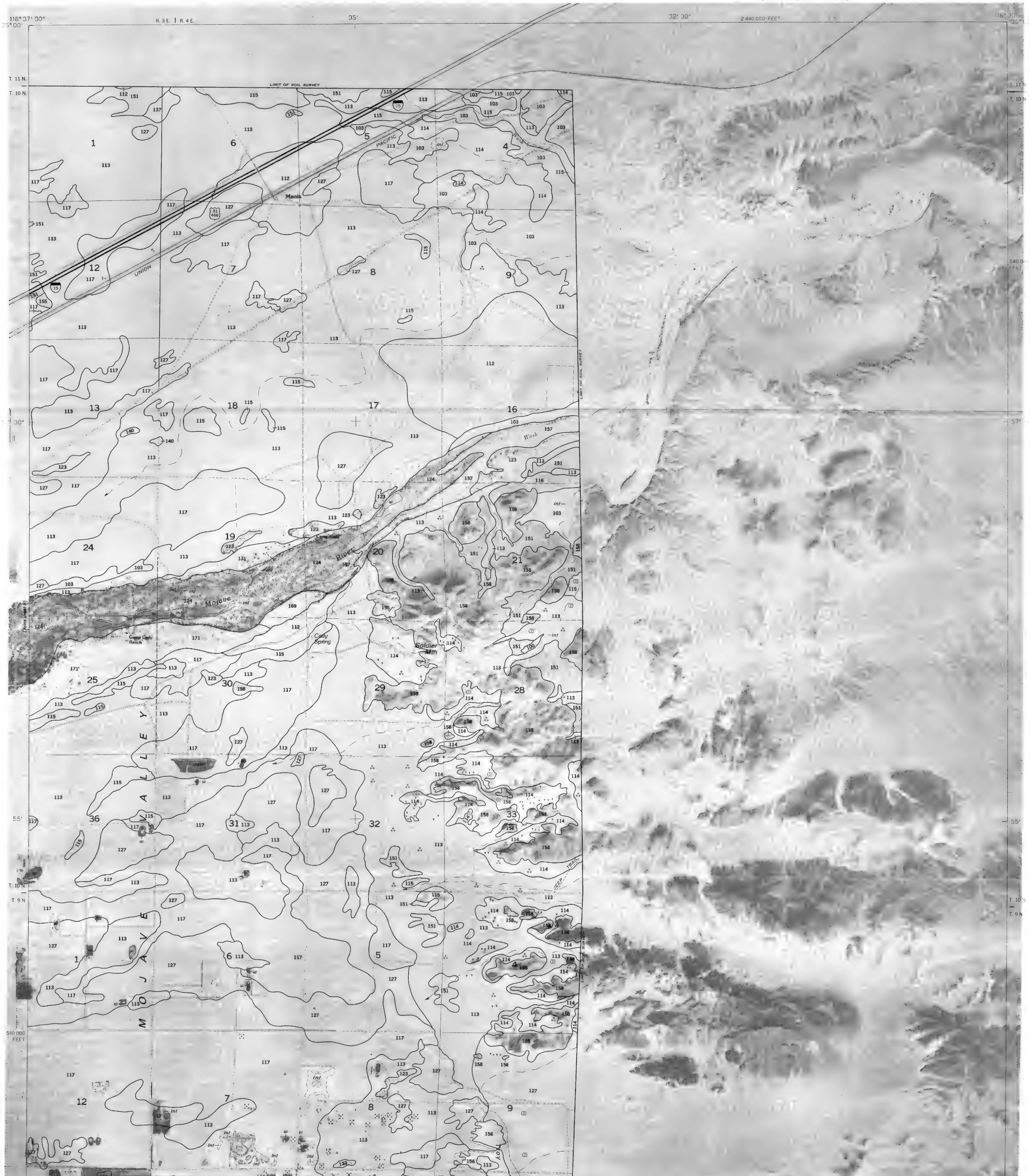
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SOIL SURVEY OF SAN BERNARDINO COUNTY, CALIFORNIA, MOJAVE RIVER AREA

(MANIX QUADRANGLE)



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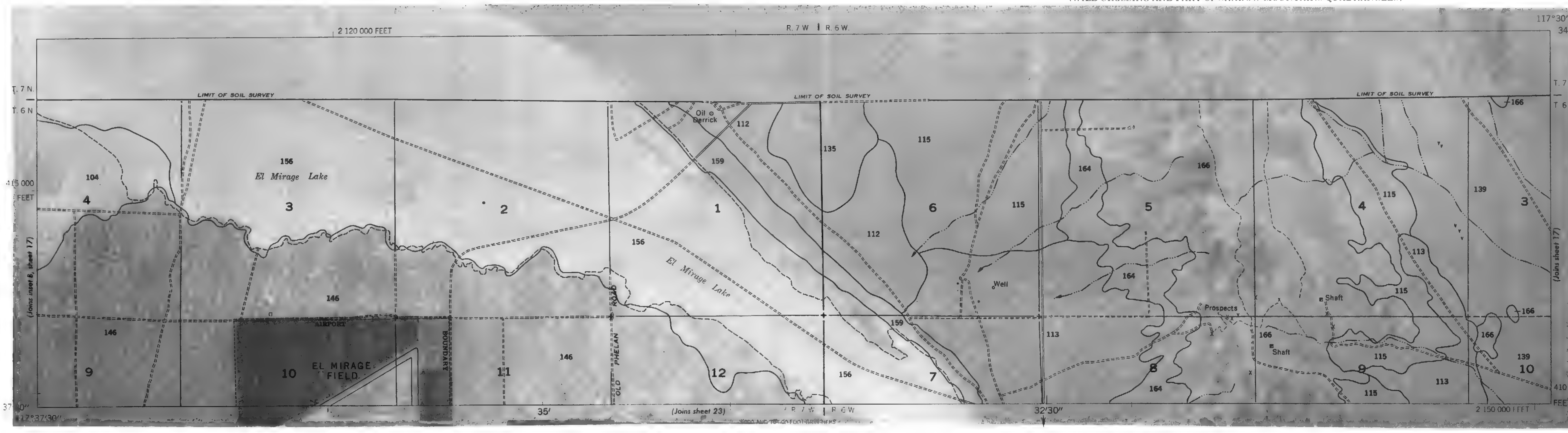
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000



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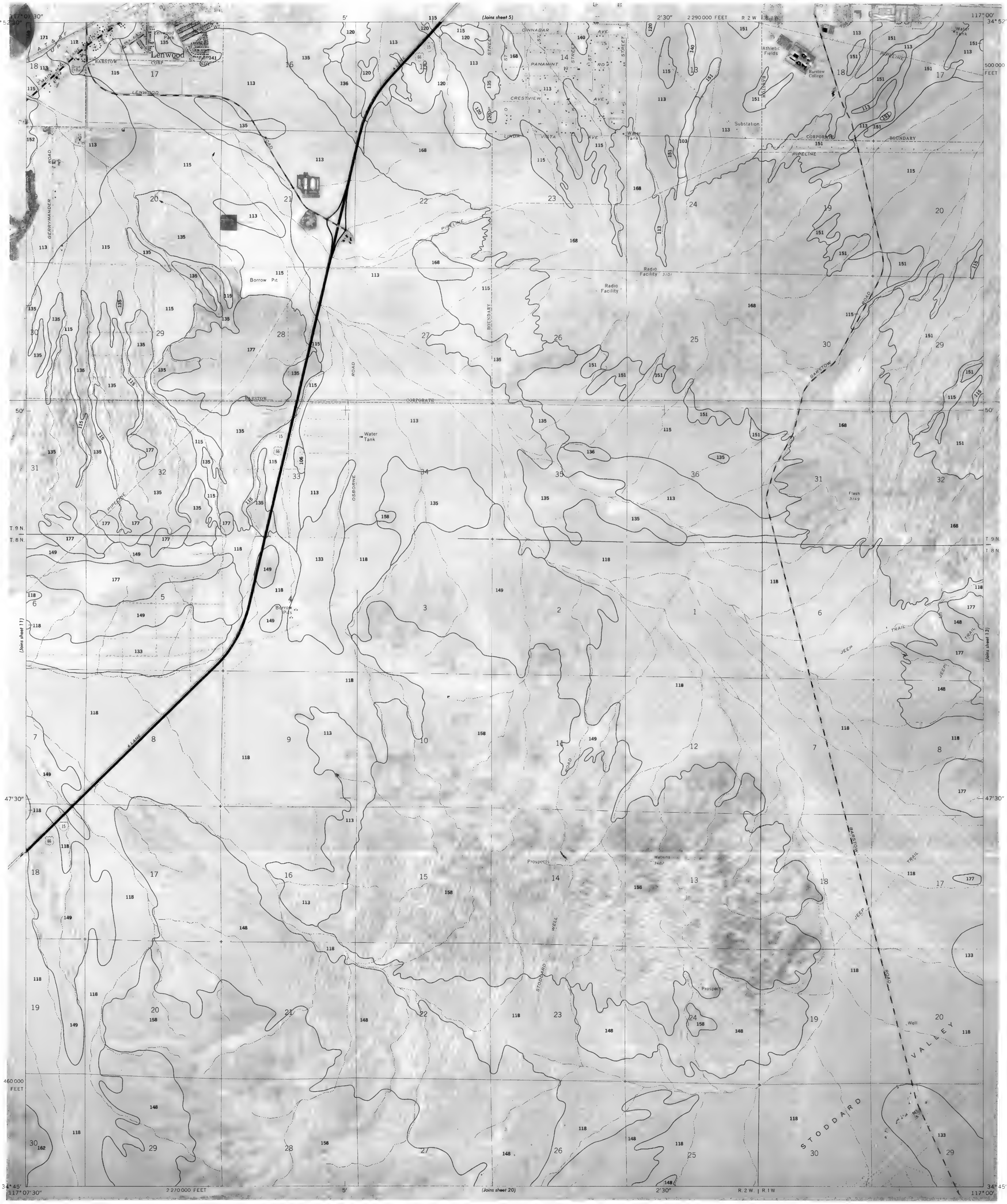

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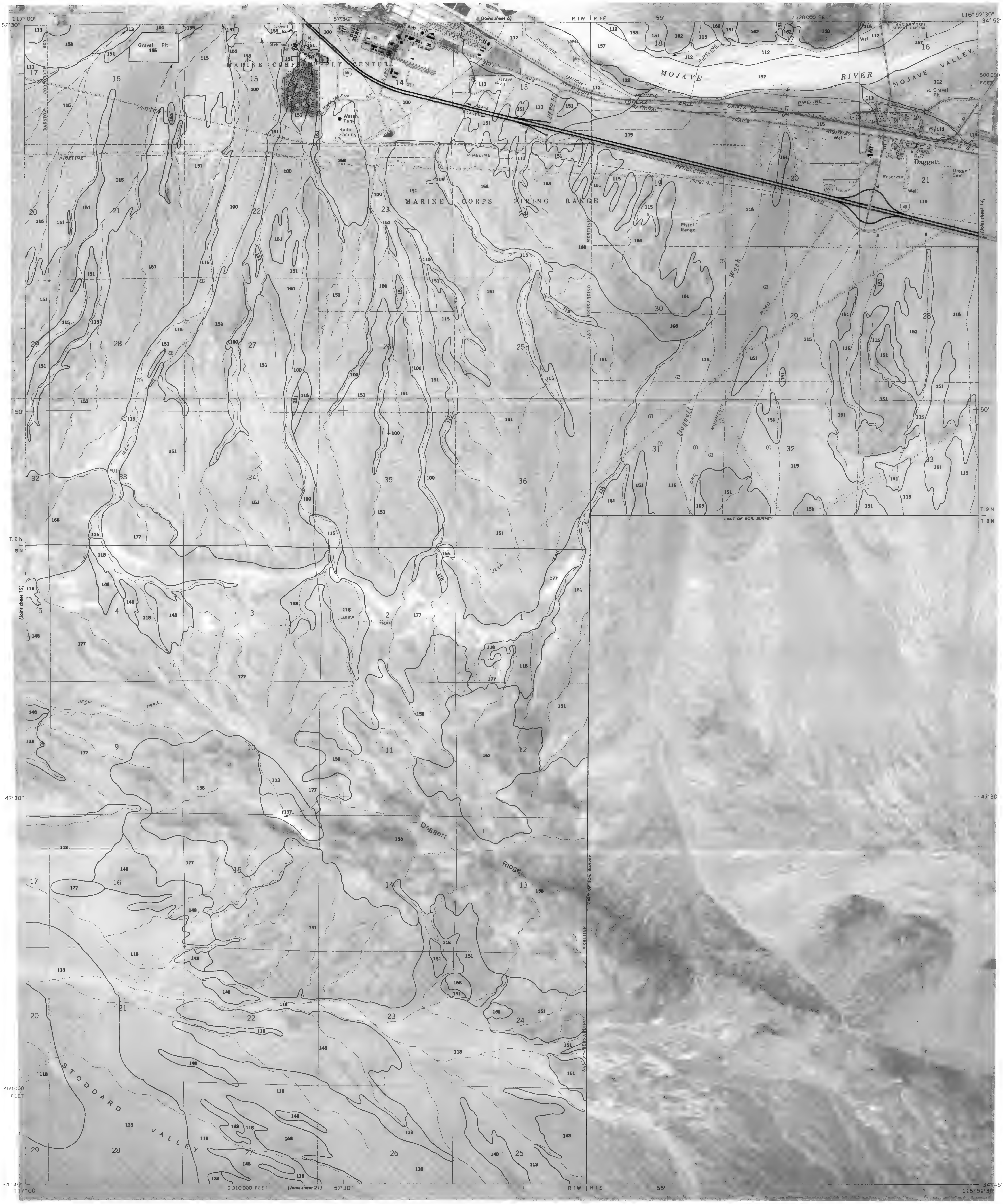

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1 3/4 1/2 1/4 0 1 2 MILES

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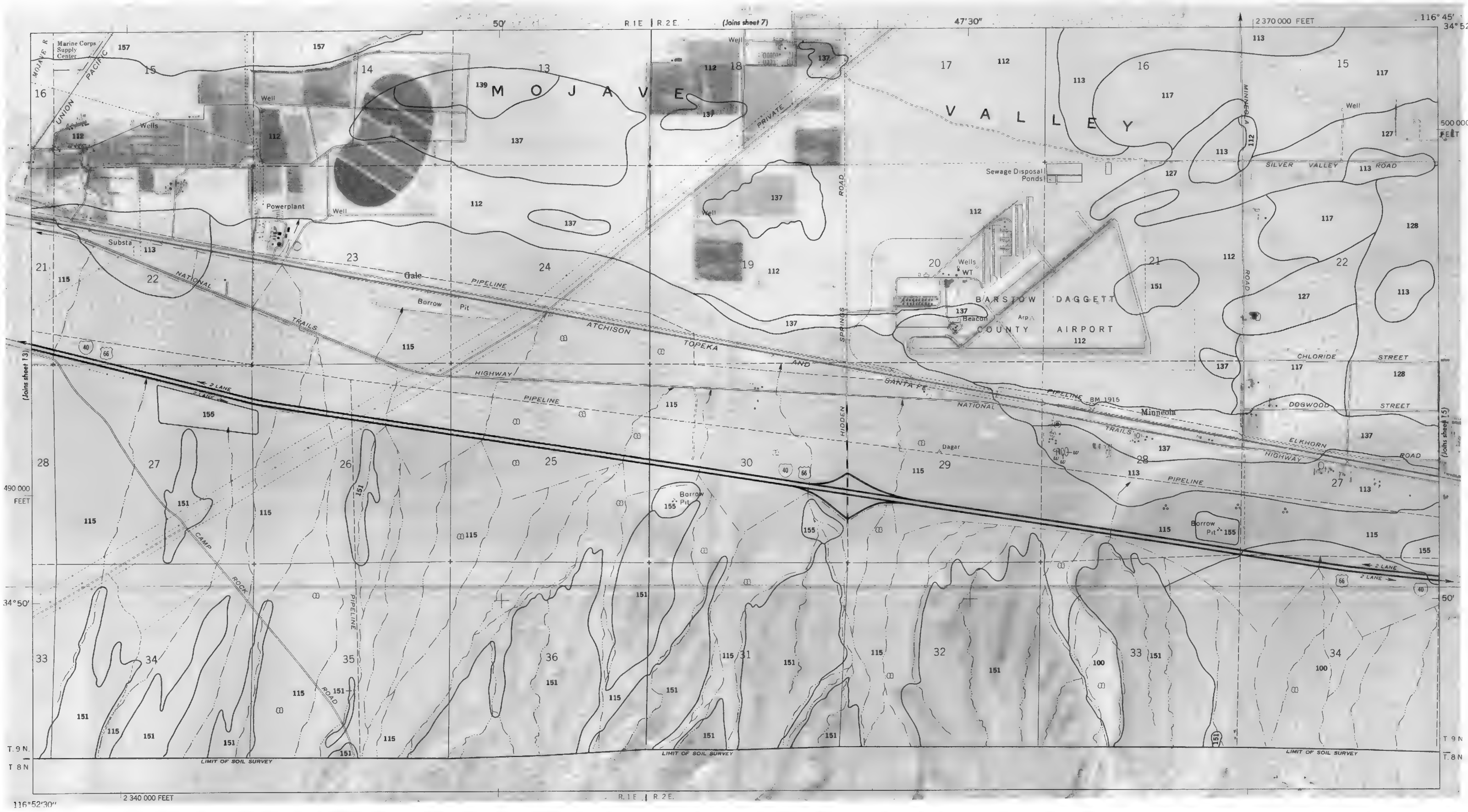

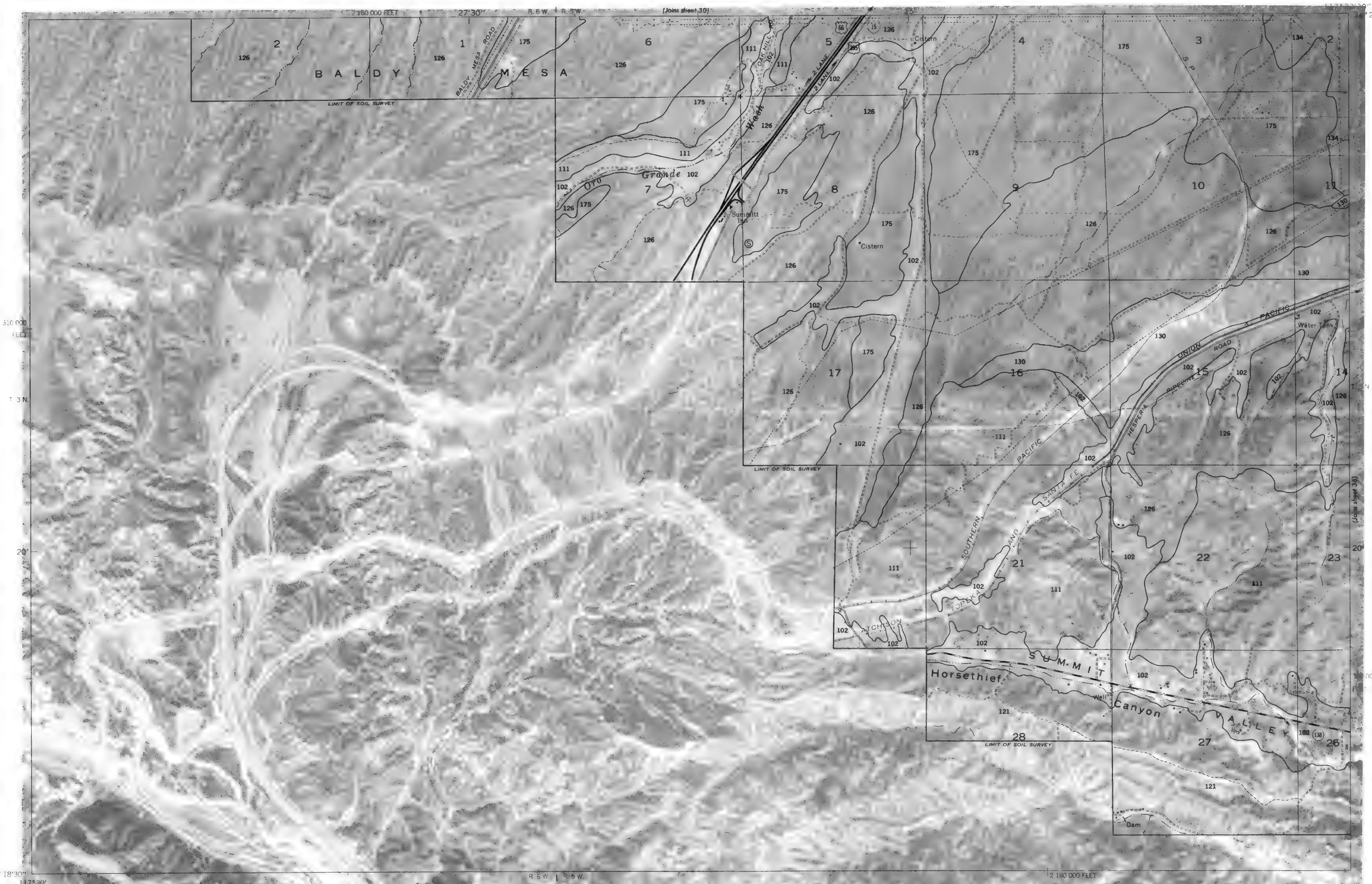

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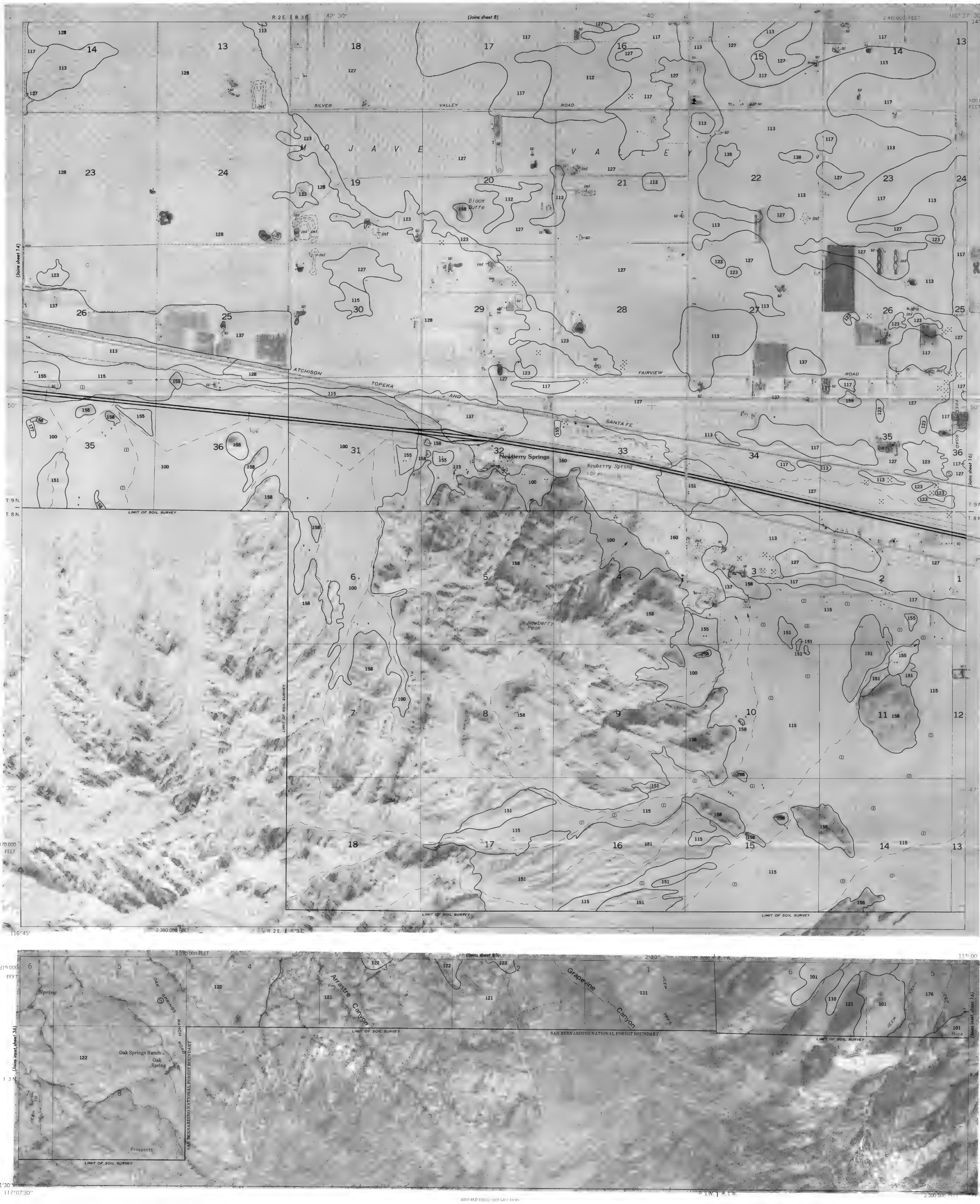

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(TROY LAKE AND PART OF FAWNSKIN QUADRANGLE)

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
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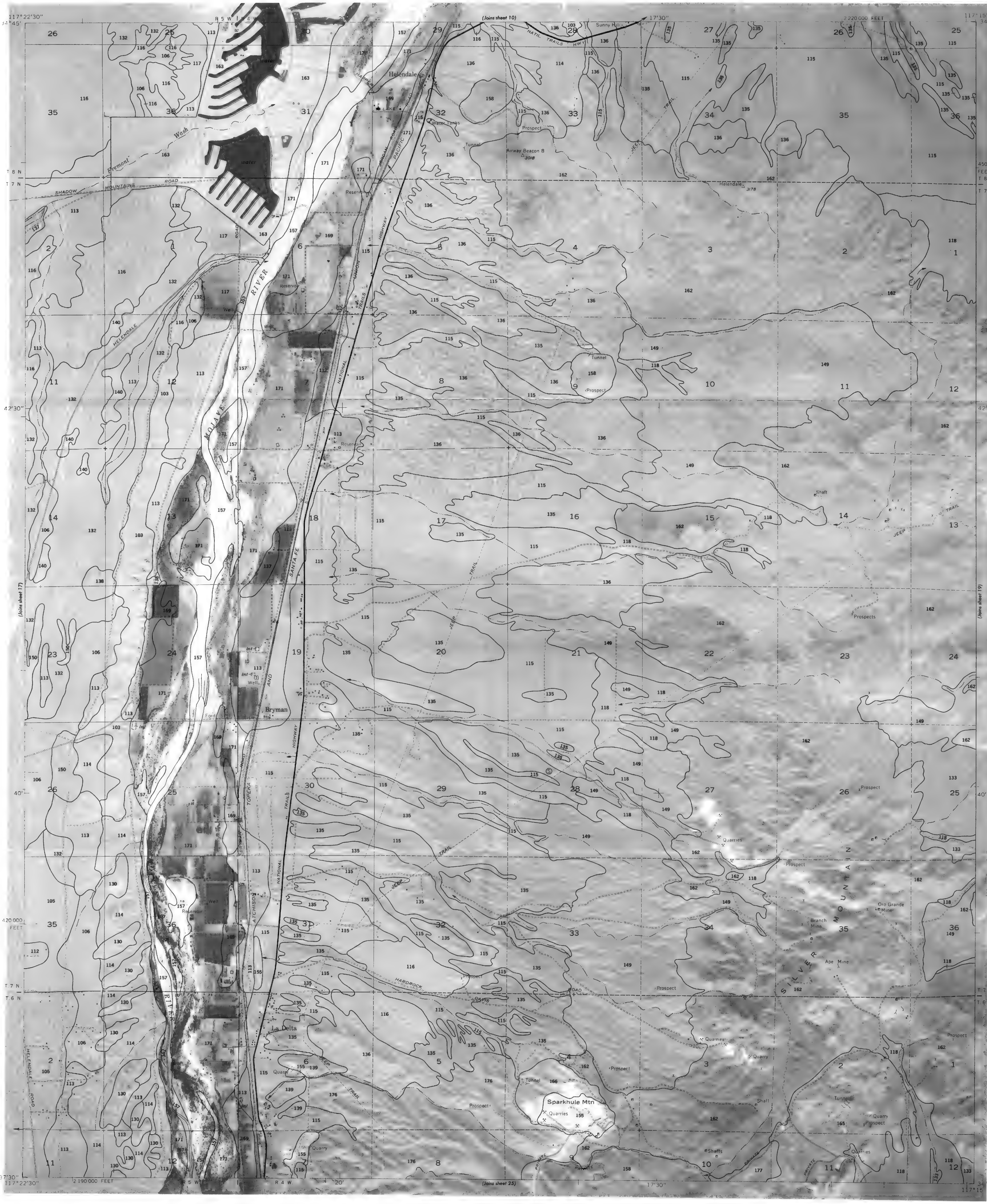
SCALE 1:24 000



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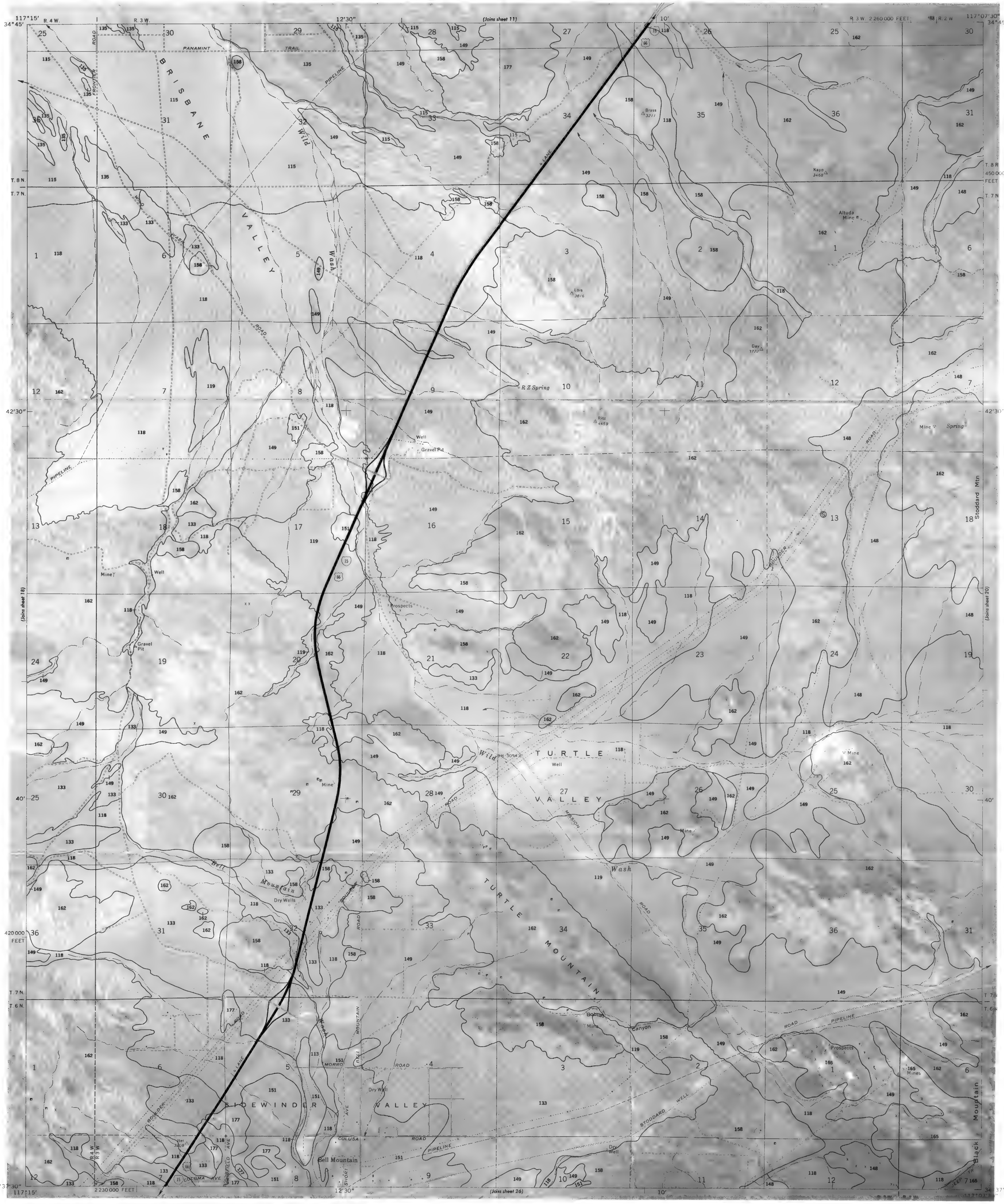
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000



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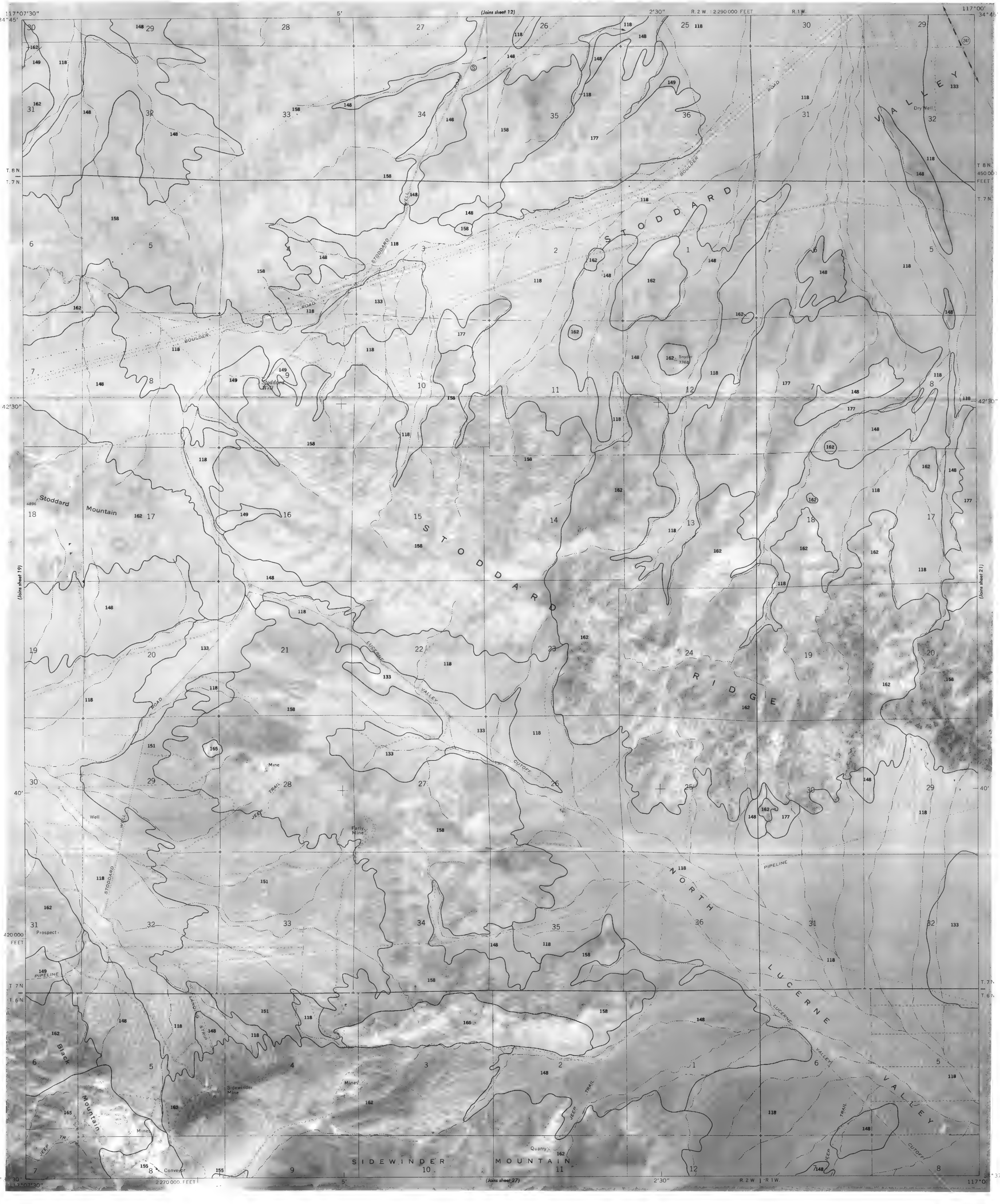

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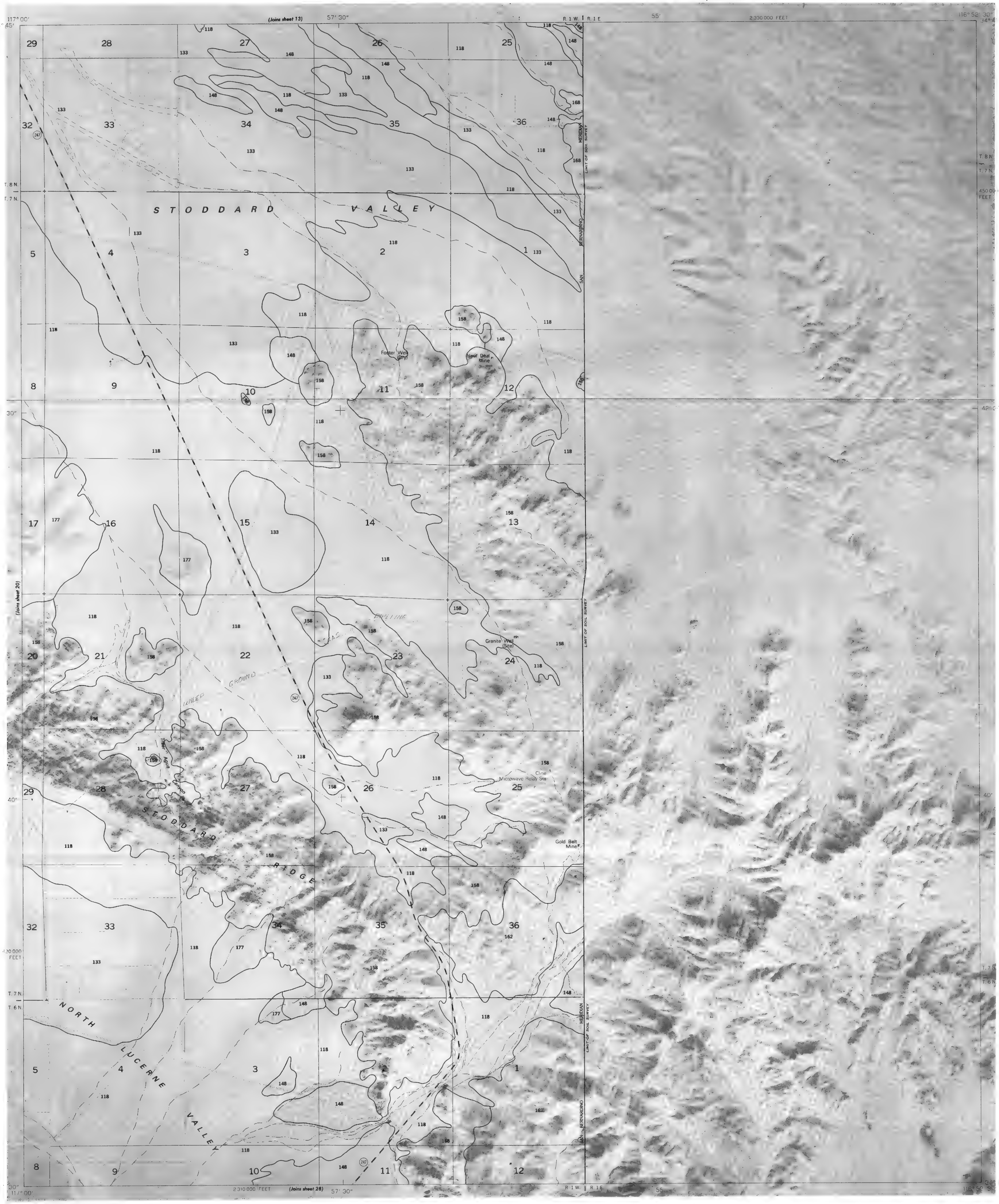

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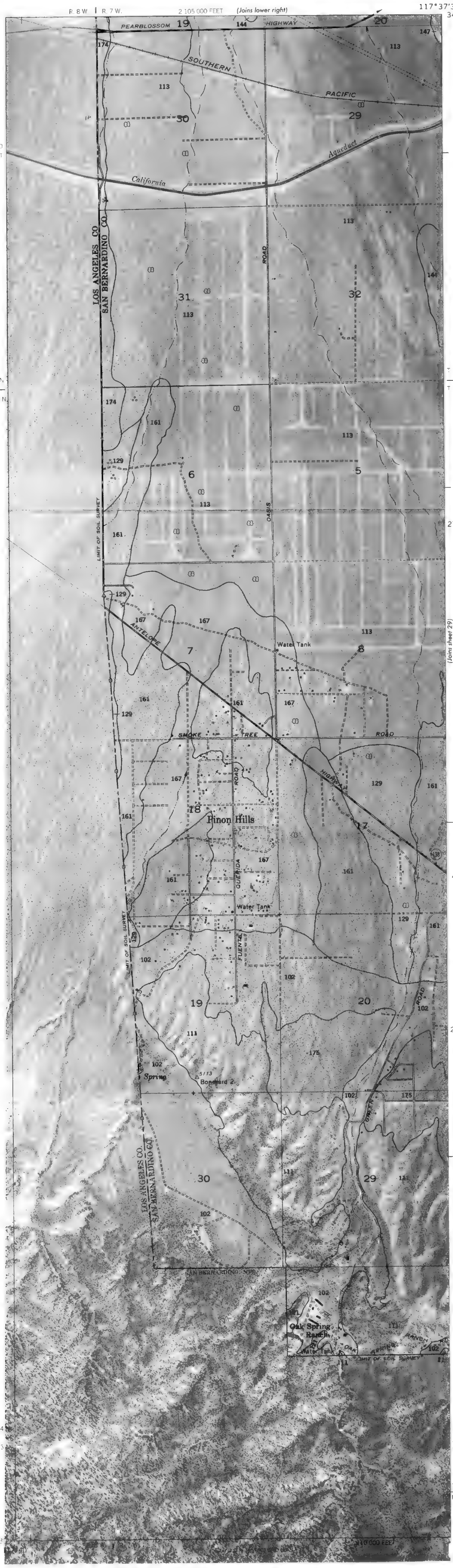
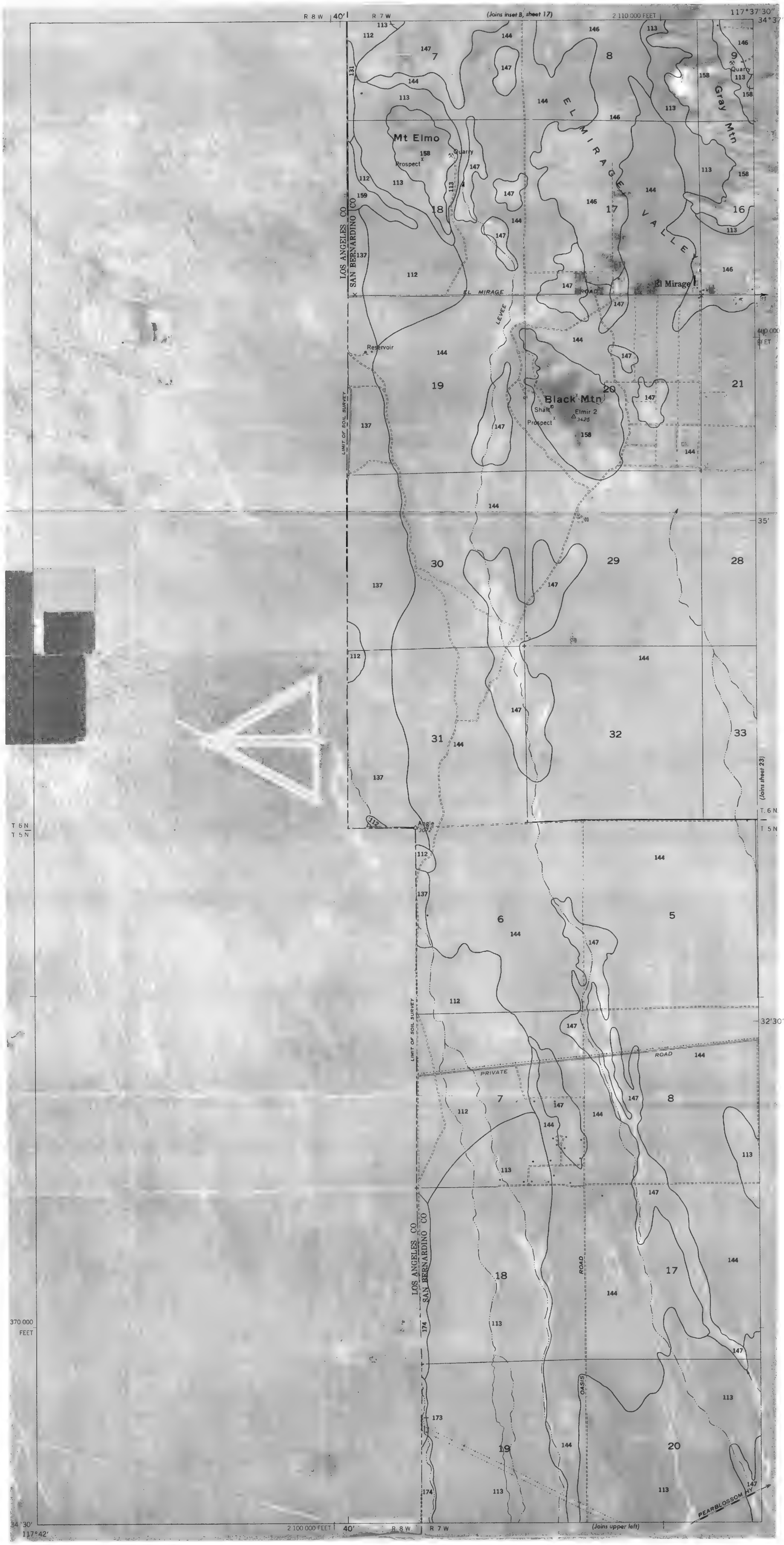
SCALE 1:24 000

SOIL SURVEY OF SAN BERNARDINO COUNTY, CALIFORNIA, MOJAVE RIVER AREA
(EL MIRAGE AND PART OF MESCAL CREEK QUADRANGLES)





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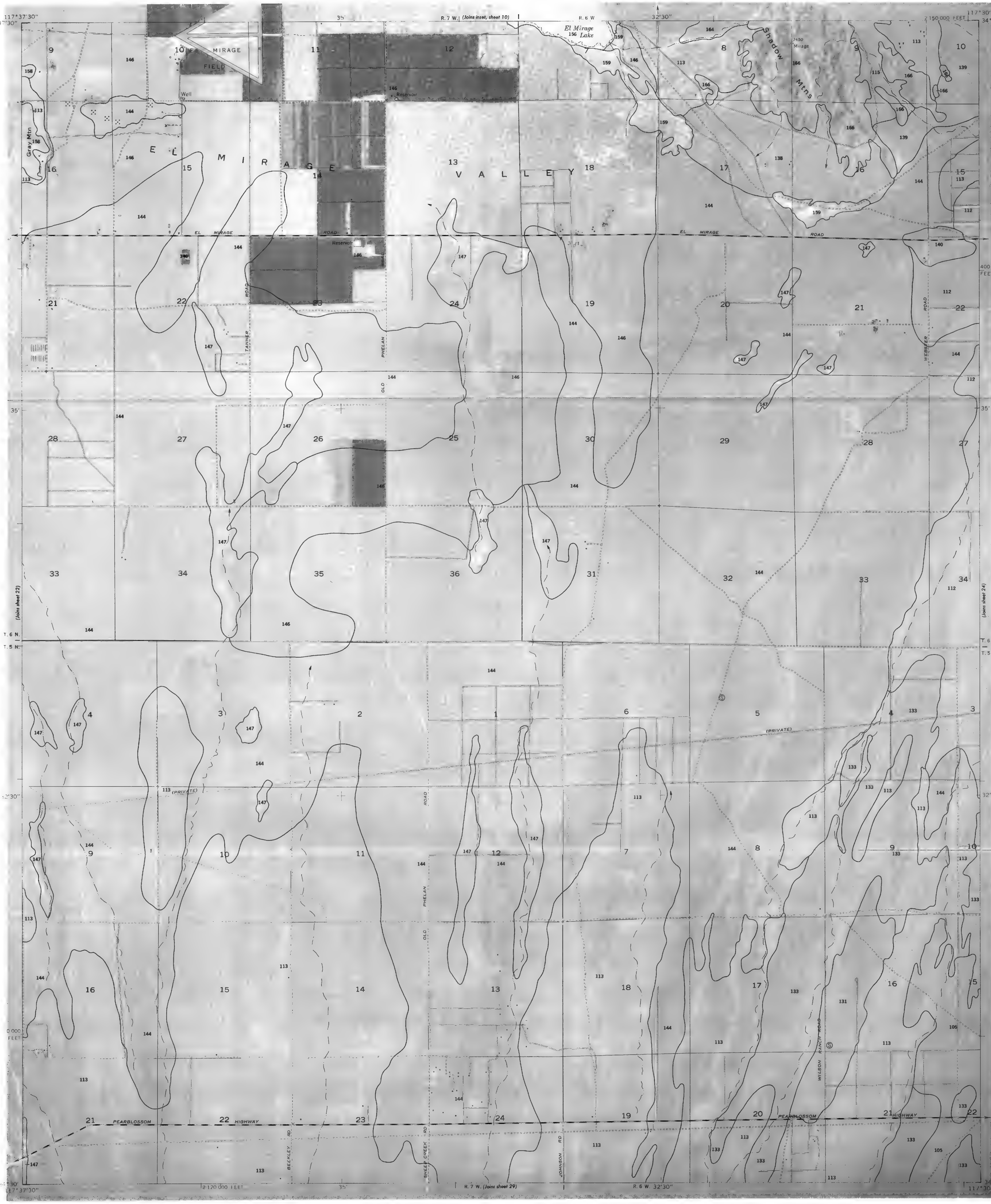
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF SAN BERNARDINO COUNTY, CALIFORNIA, MOJAVE RIVER AREA
(SHADOW MOUNTAINS, S.E. QUADRANGLE)



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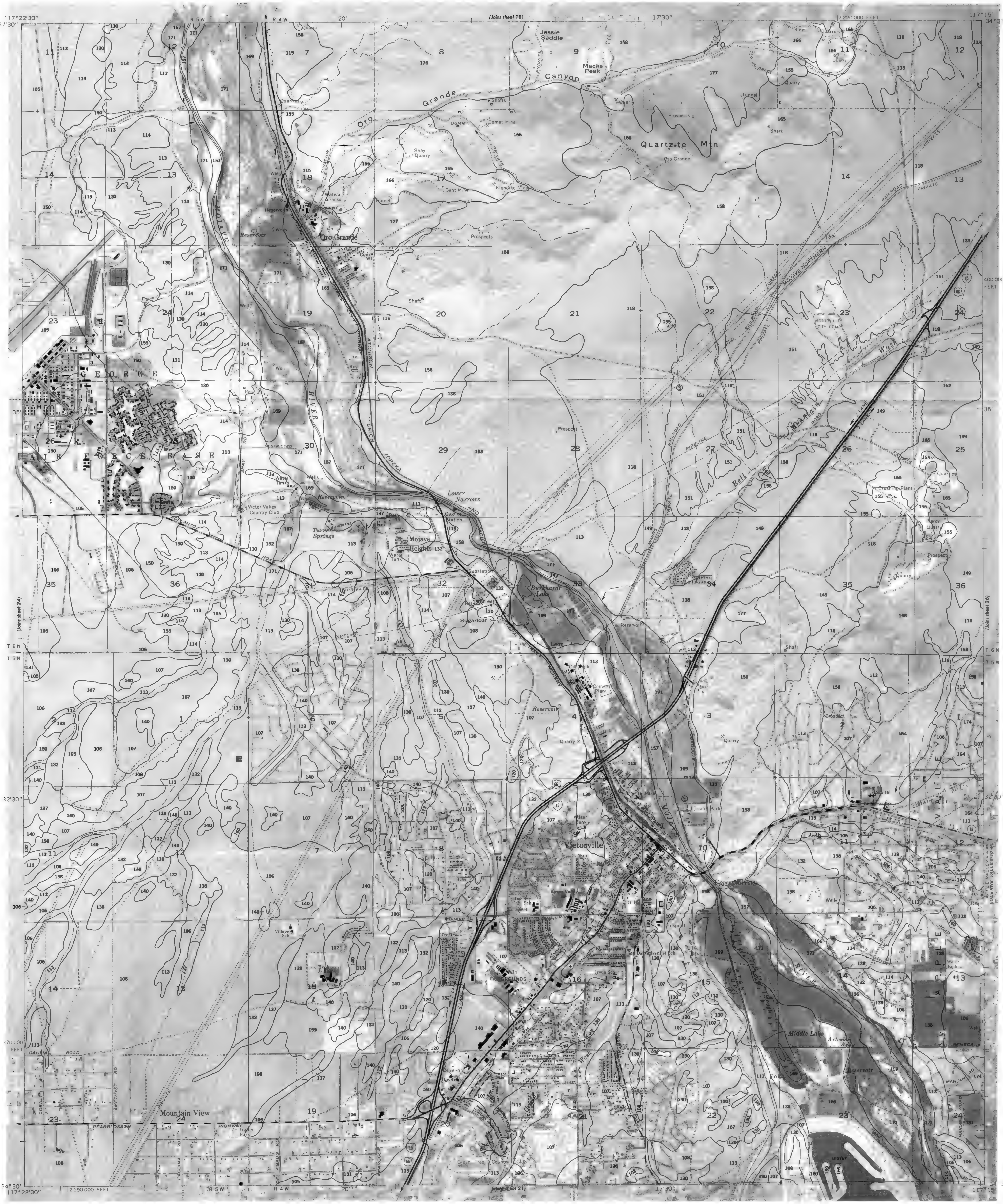
SCALE 1:24 000



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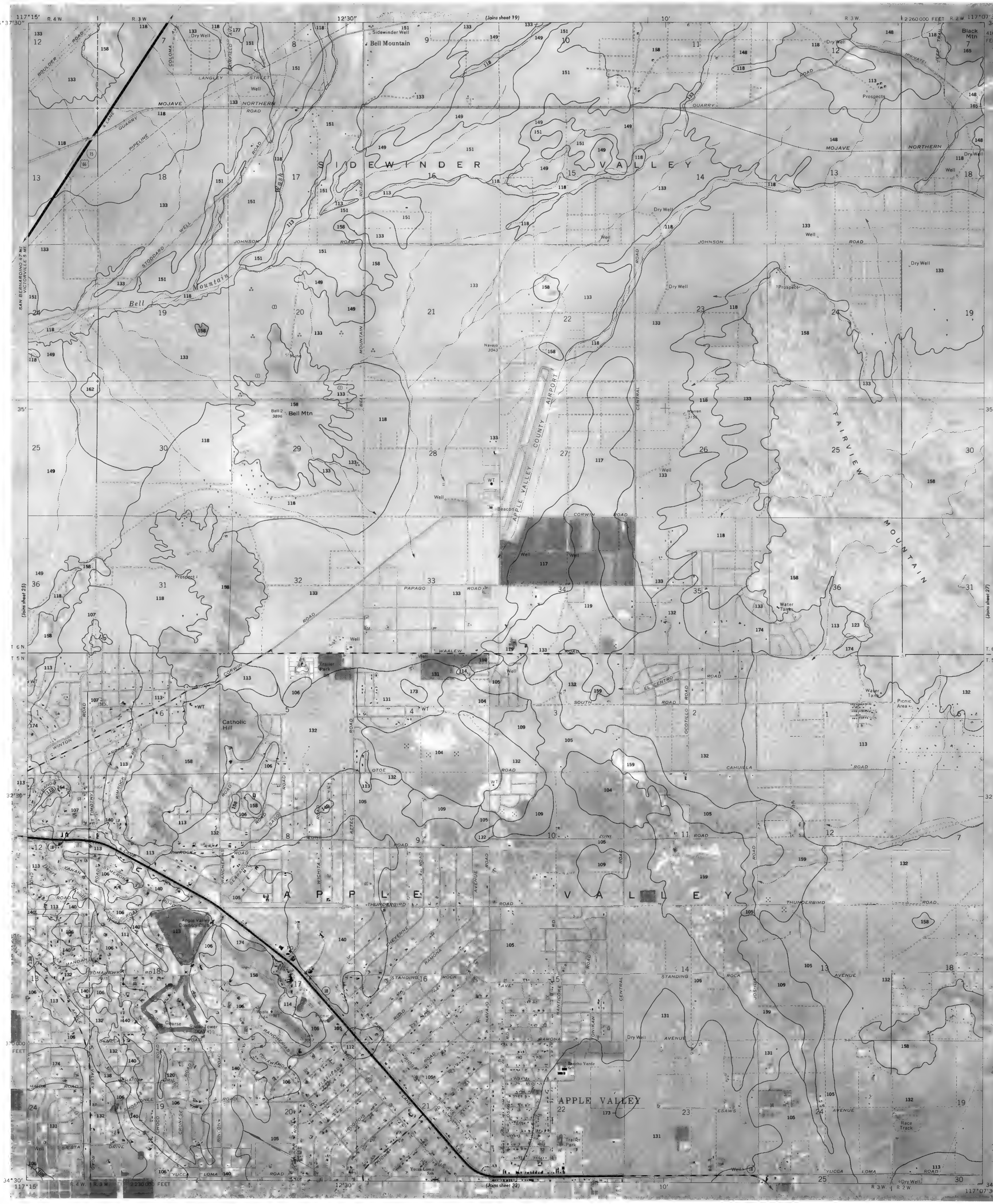

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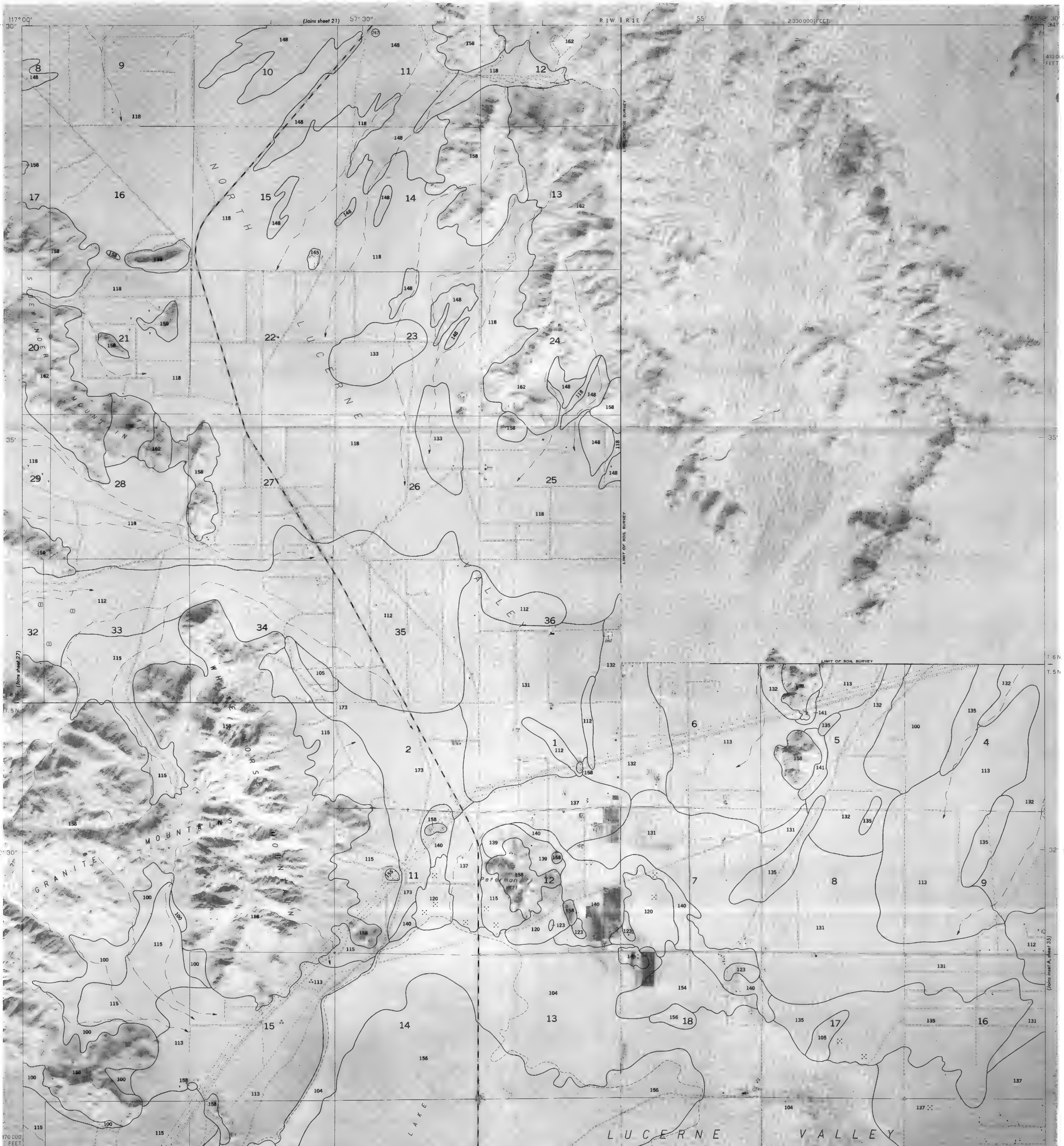

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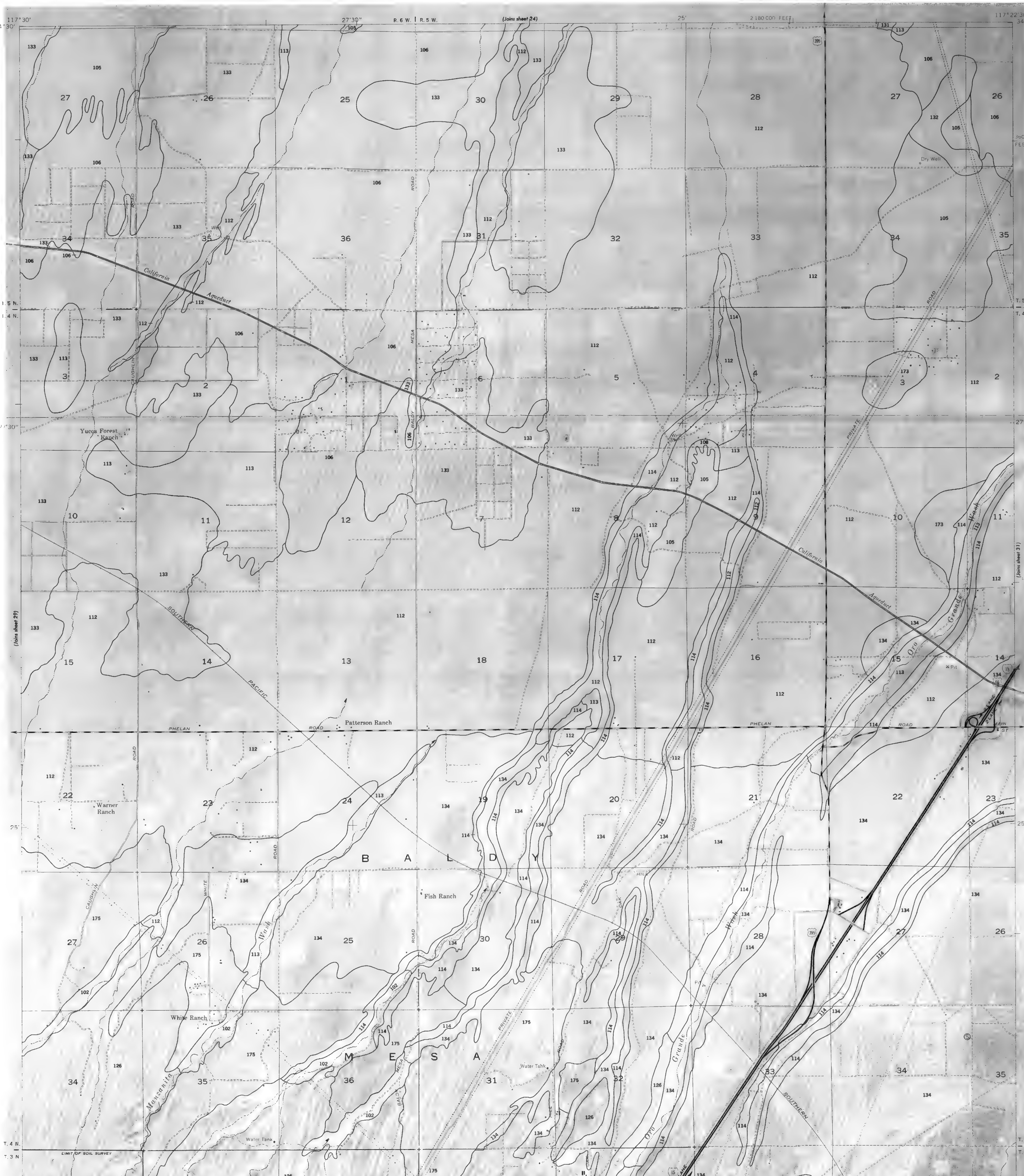
SCALE 1:24 000

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF SAN BERNARDINO COUNTY, CALIFORNIA, MOJAVE RIVER AREA
(BALDY MESA QUADRANGLE)



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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
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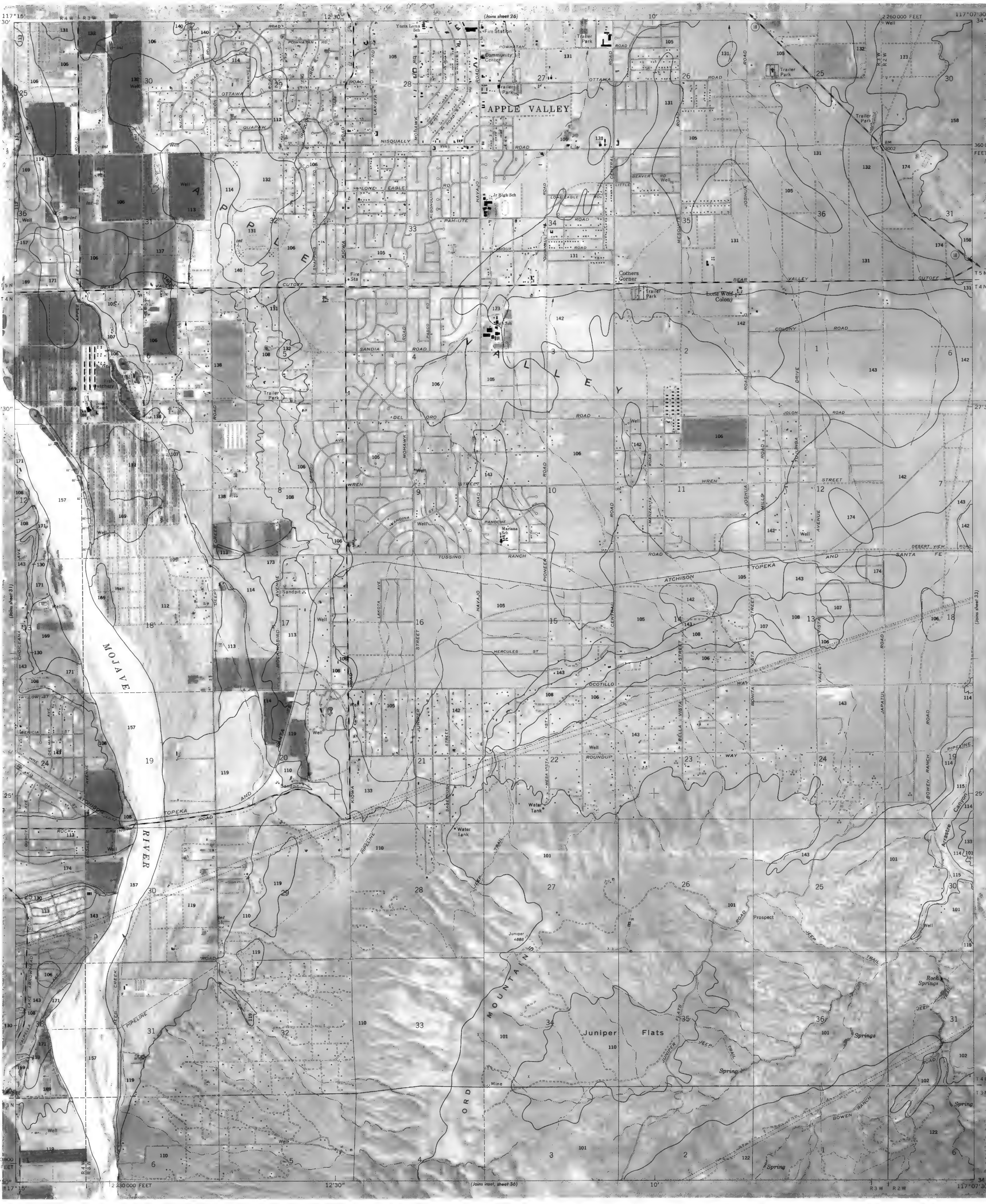
SCALE 1:24 000
1 MILES ... 2 MILES
1 KILOMETERS ... 2 KILOMETERS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SURVEY OF SAN BERNARDINO COUNTY, CALIFORNIA, MOJAVE RIVER AREA
(APPLE VALLEY, S. QUADRANGLE)



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1 3/4 1/2 1/4 0 1 2 MILES
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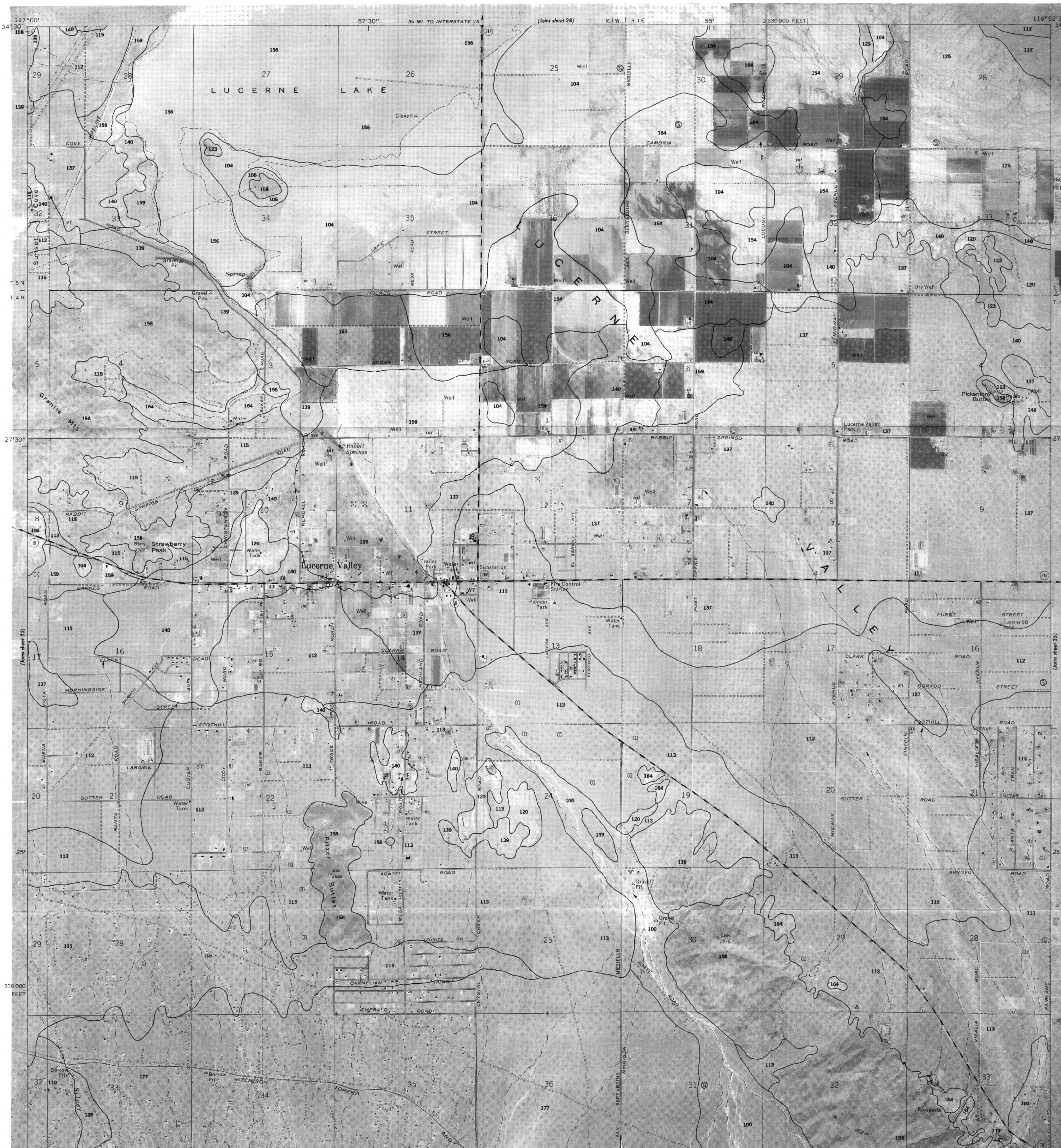
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SOIL SURVEY OF SAN BERNARDINO COUNTY, CALIFORNIA, MOJAVE RIVER AREA

(LUCERNE VALLEY QUADRANGLE)



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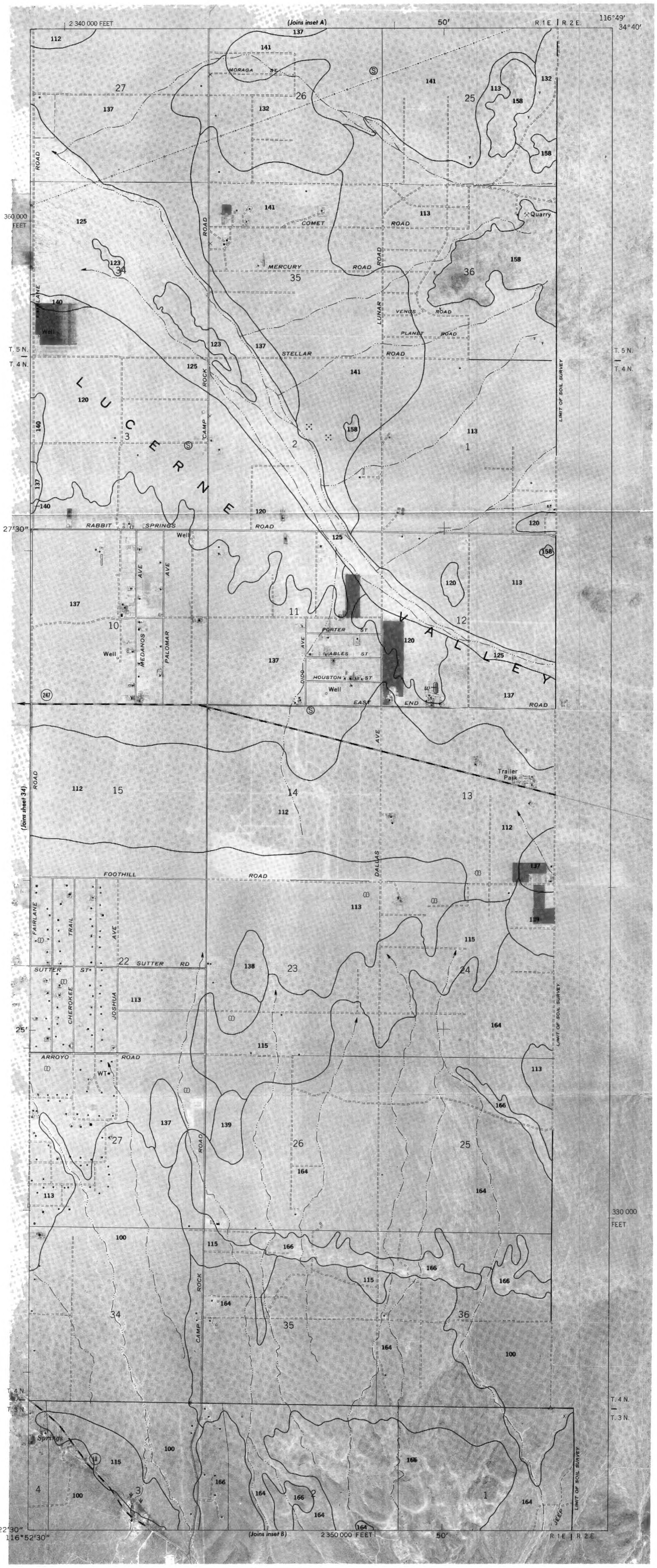
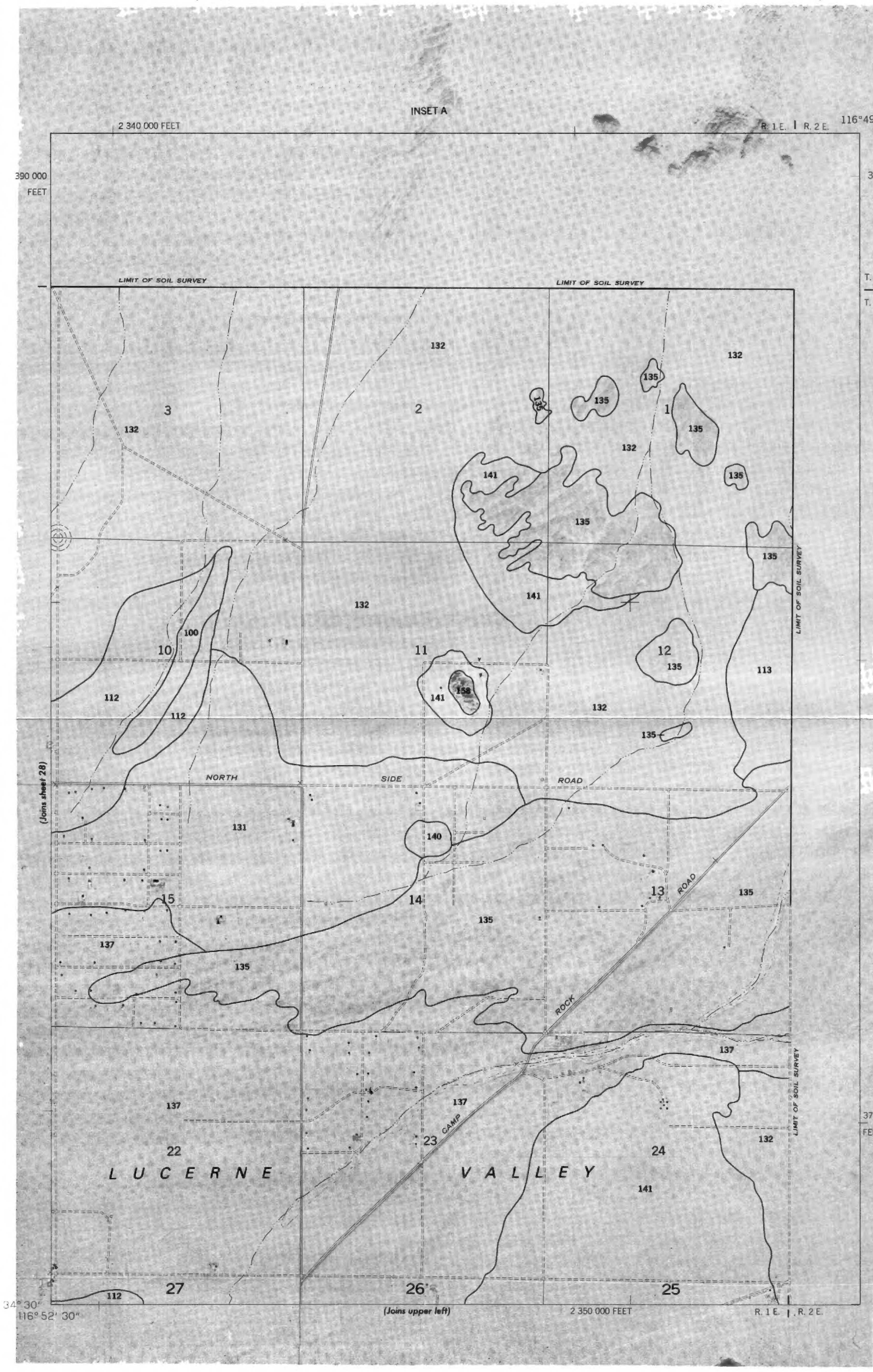
1 3/4 1/2 1/4 0 1 2 MILES

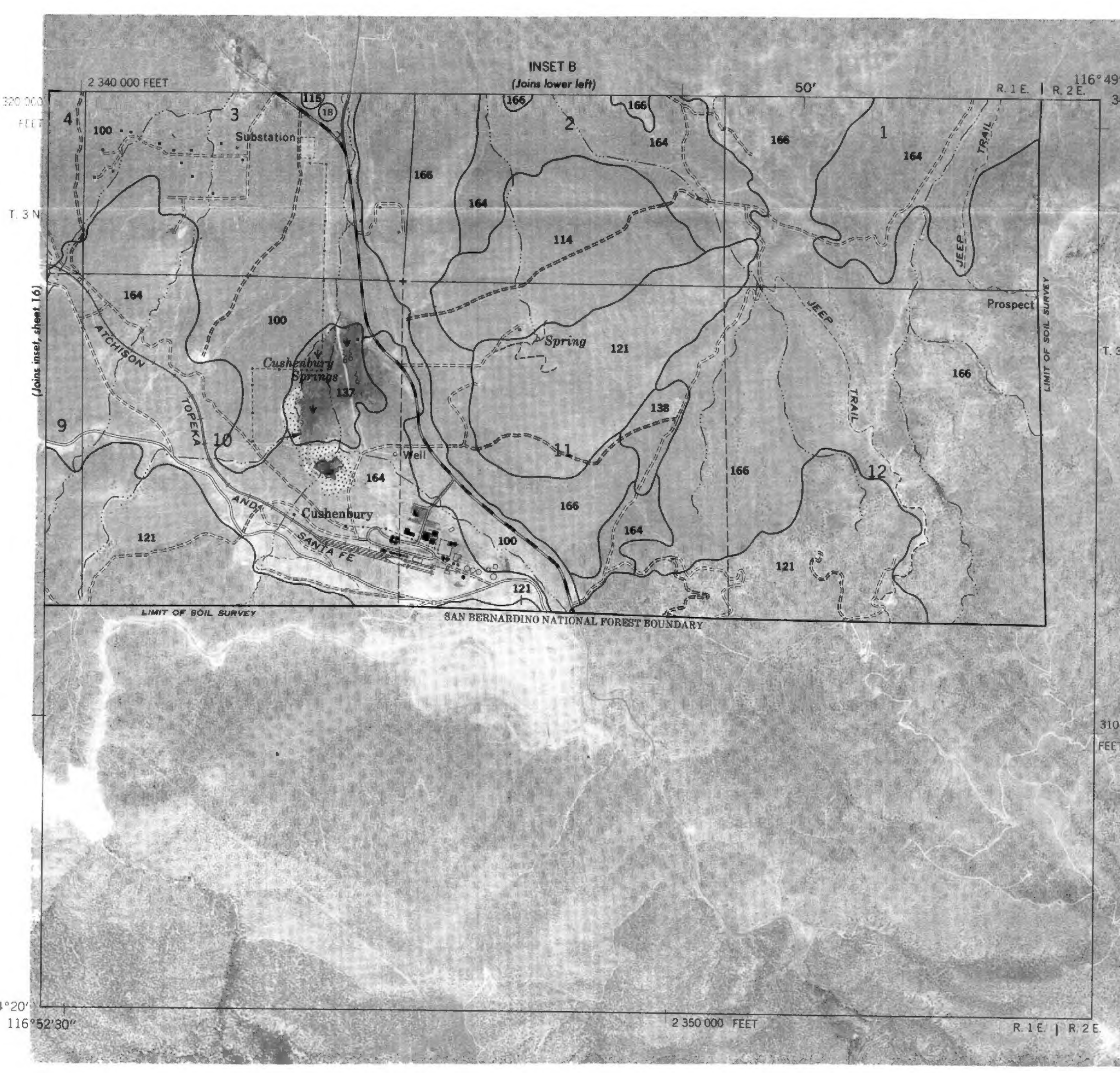
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

SOIL SURVEY OF SAN BERNARDINO COUNTY, CALIFORNIA, MOJAVE RIVER AREA
(COUGAR BUTTES AND PARTS OF GRAND VIEW MINE AND BIG BEAR CITY QUADRANGLES)







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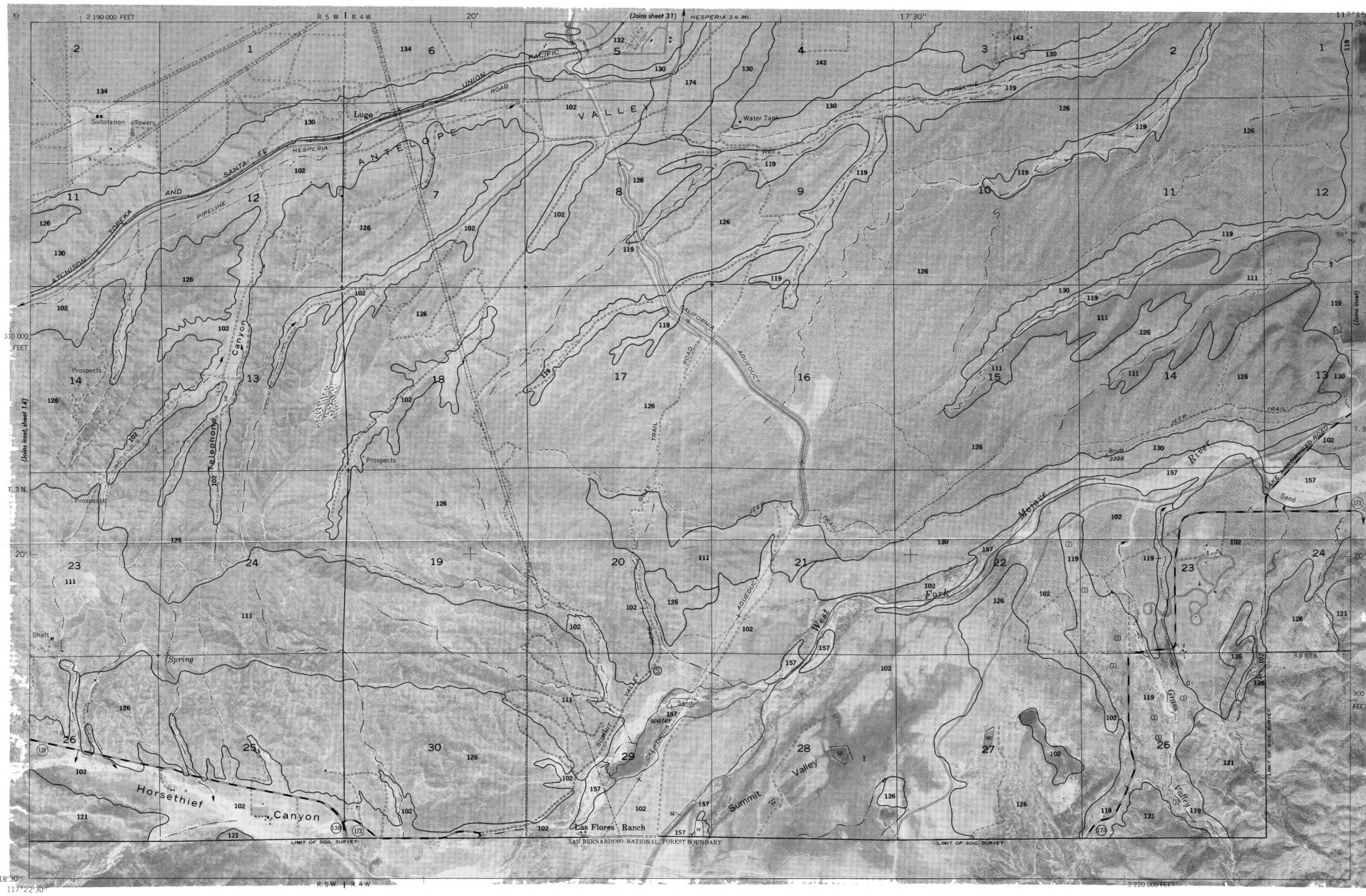
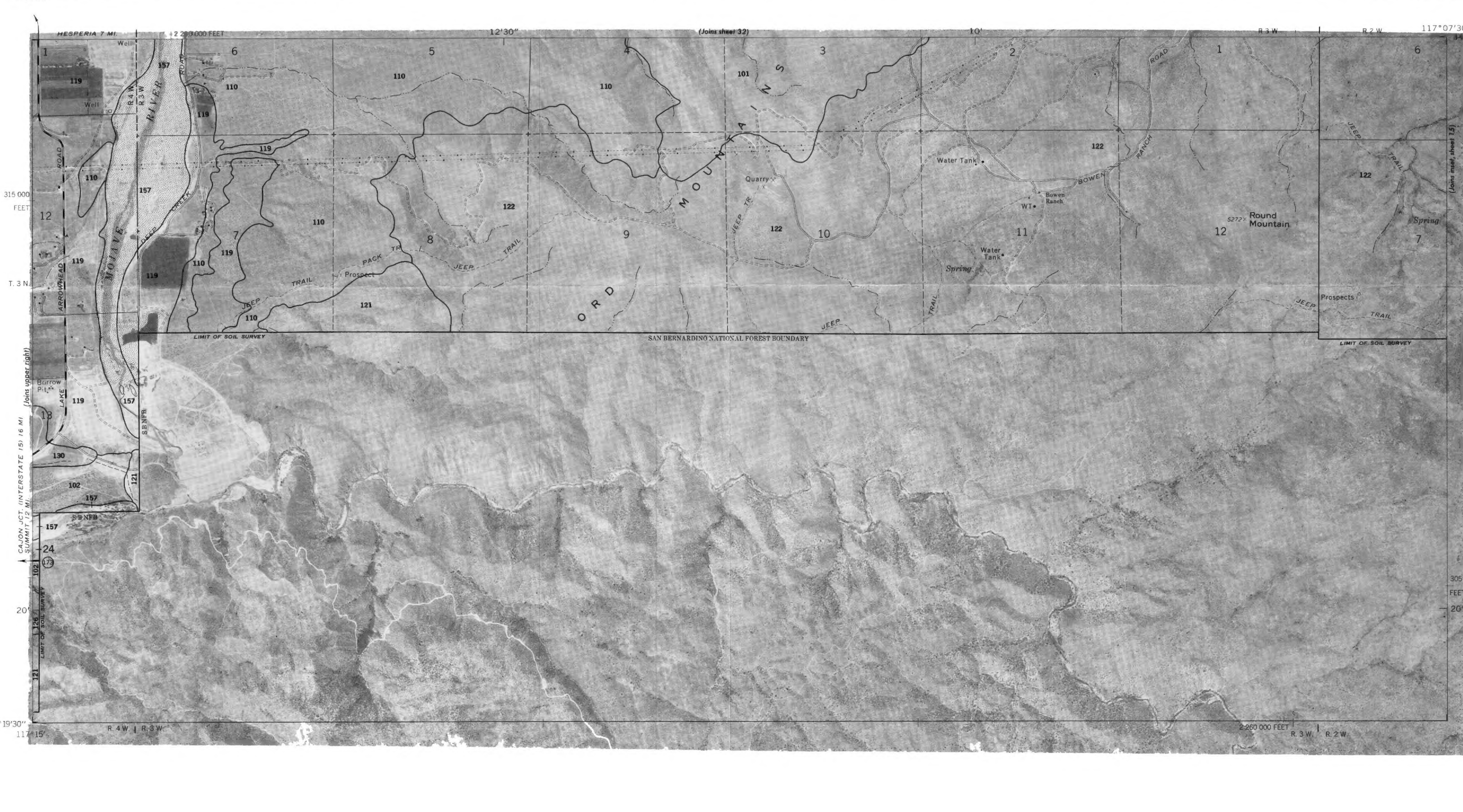
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000





This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1975, 1976, and 1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SCALE 1:24 000